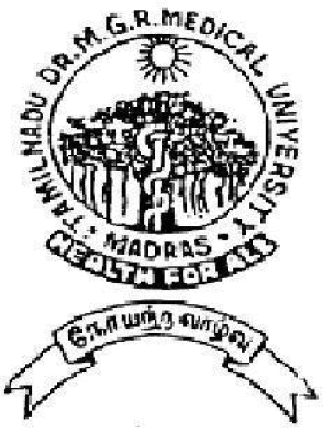
PANCREATICOGASTROSTOMY VERSUS BINDING PANCREATICOJEJUNOSTOMY AFTER PANCREATICODUODENECTOMY- A COMPARITIVE STUDY

DISSERTATION SUBMITTED FOR

MASTER OF SURGERY

BRANCH - I (GENERAL SURGERY)

APRIL – 2017



DEPARMENT OF GENERAL SURGERY

MADURAI MEDICAL COLLEGE

MADURAI 625020

THE TAMILNADU

DR.M.G.R. MEDICAL UNIVERSITY,

CHENNAI

BONAFIDE CERTIFICATE

This is to certify that the dissertation entitled **PANCREATICOGASTROSTOMY VERSUS BINDING PANCREATICOJEJUNOSTOMY AFTER PANCREATICODUODENECTOMY - A COMPARITIVE STUDY** is a bonafide record work done by **Dr. MUPPALLA N V N YESASWY** under my direct supervision and guidance, submitted to the Tamil Nadu Dr. M.G.R. Medical University in partial fulfilment of University regulation for M.S. General Surgery, Branch I during the period of January 2015 to July 2016.

Dr.D. MARUTHUPANDIYAN. M.S.,
Professor & Head of the Department
Department of General Surgery,
Madurai Medical College,
Madurai.

Dr.P.AMUTHA M.S.,
Professor & Unit Chief
Dept of General Surgery
Madurai Medical College
Madurai.

CERTIFICATE BY THE DEAN

This is to certify that the dissertation entitled "**PANCREATICOGASTROSTOMY VERSUS BINDING PANCREATICOJEJUNOSTOMY AFTER PANCREATICODUODENECTOMY- A COMPARITIVE STUDY**" is a bonafide research work done by **Dr. MUPPALLA N V N YESASWY** Post Graduate Student, Department of General Surgery, MADURAI MEDICAL COLLEGE AND GOVERNMENT RAJAJI HOSPITAL, MADURAI, under the guidance and supervision of **Prof.Dr.P.AMUTHA M.S.** Professor Department of Surgery, MADURAI MEDICAL COLLEGE AND GOVERNMENT RAJAJI HOSPITAL, MADURAI.

Place : Madurai

Date :

Prof. Dr. M.R. VAIRAMUTHU RAJU M.D.,

DEAN

MADURAI MEDICAL COLLEGE

GOVT. RAJAJI HOSPITAL, MADURAI

DECLARATION

I, **Dr. MUPPALLA N V N YESASWY** solemnly declare that the dissertation titled **PANCREATICOGASTROSTOMY VERSUS BINDING PANCREATICOJEJUNOSTOMY AFTER PANCREATICODUODENECTOMY- A COMPARITIVE STUDY** has been prepared by me. I also declare that this bonafide work or a part of this work was not submitted by me or any other for any award, degree, diploma to any other University board either in India or abroad.

This is submitted to The Tamilnadu Dr. M. G. R. Medical University, Chennai in partial fulfillment of the rules and regulation for the award of M.S.(General Surgery) Branch – I to be held in April 2017.

Place: Madurai **Dr. MUPPALLA N V N YESASWY**

Date:

ACKNOWLEDGEMENT

At the outset I wish to thank our Unit Chief Prof. **Dr. P. AMUTHA MS,** and my Assistant Professors **Dr. P.GANESH M.S., Dr.T.VANITHA. M.S. D.A, Dr. SUGANYA M.S.,** for their valuable guidance and advices.

I wish to express my sincere gratitude to **Prof Dr.D.MARUTHUPANDIYAN. M.S.,** Professor and Head of the Department of Surgery, for their expert supervision, due to which, I could complete this study successfully.

I wish to express my sincere gratitude to **Prof Dr.S.PADMANABHAN. M.S. Mch,** Professor and Head of the Department of Surgical Gastroentrology & Minimally invasive surgery, for his expert supervision, due to which, I could complete this study successfully.

I am greatly indebted to our **'DEAN' Prof. DR M.R. VAIRAMUTHU RAJU, M.D.,** Govt. Rajaji Hospital, Madurai for his kind permission to allow me to utilize the clinical material from the hospital.

I whole heartedly thank all the patients who willingly co-operated and rendered themselves for the study without whom this study couldn't have been a reality.

Abbreviations

PD	:	Pancreaticoduodenectomy
PG	:	Pancreaticogastrostomy
Binding PJ/PJ	:	Binding Pancreaticojejunostomy/ Pancreaticojejunostomy
POPF	:	Post operative Pancreatic Fistula
DGE	:	Delayed gastric emptying
SMA/SMV	:	Superior Mesenteric Artery/Vein
PV	:	Portal Vein
HJ	:	Hepaticojejunostomy
GJ	:	Gastrojejunostomy
RCT's	:	Randomised controlled trails

CONTENTS

INTRODUCTION

Pancreaticoduodenectomy (PD) has become increasingly accepted as a safe and appropriate surgical technique for patients with either malignant or benign diseases of the pancreas and periampullary region. In high-volume centers, Perioperative mortality rate is currently reported to be below 5% for PD. However, the rate of post-PD complications is still as high as 40–50%, Post operative pancreatic fistula (POPF) rate is nowadays about 14%-25%.

Pancreatic Fistula remains the single most important cause of morbidity. Many factors have been associated with pancreatic fistula formation after PD, in that type of pancreatic anastomosis & Operating Surgeon plays an important role.

Many types of reconstruction have been described, either it is Pancreaticogastrostomy(PG) or pancreaticojejunostomy(PJ). The best technique in pancreatic anastomosis is still debated. Retrospective studies suggest superiority of PG over PJ in terms of reduced POPF and other complications. Conflicting results have been reported from 8 prospective RCTs.

A recent multicenter prospective randomized controlled trial comparing PG with PJ was conducted in Germany high-volume academic centres for pancreatic surgery. The rate of pancreatic fistula after PG versus PJ was not significantly different.

AIM & OBJECTVE OF THE STUDY:

The method of pancreatic reconstruction after pancreaticoduodenectomy (PD) is closely associated with postoperative morbidity, mortality, and patient's quality of life. The objective of this study is to evaluate which anastomosis approach – pancreaticogastrostomy (PG) or Binding pancreaticojejunostomy (PJ), is a better option of choice in terms of postoperative complications.

Surgical Anatomy of duodenum & Pancreas:

The first portion of the duodenum (D1) is approximately 5 cm long, and passes upward from the pylorus to the neck of the gallbladder.

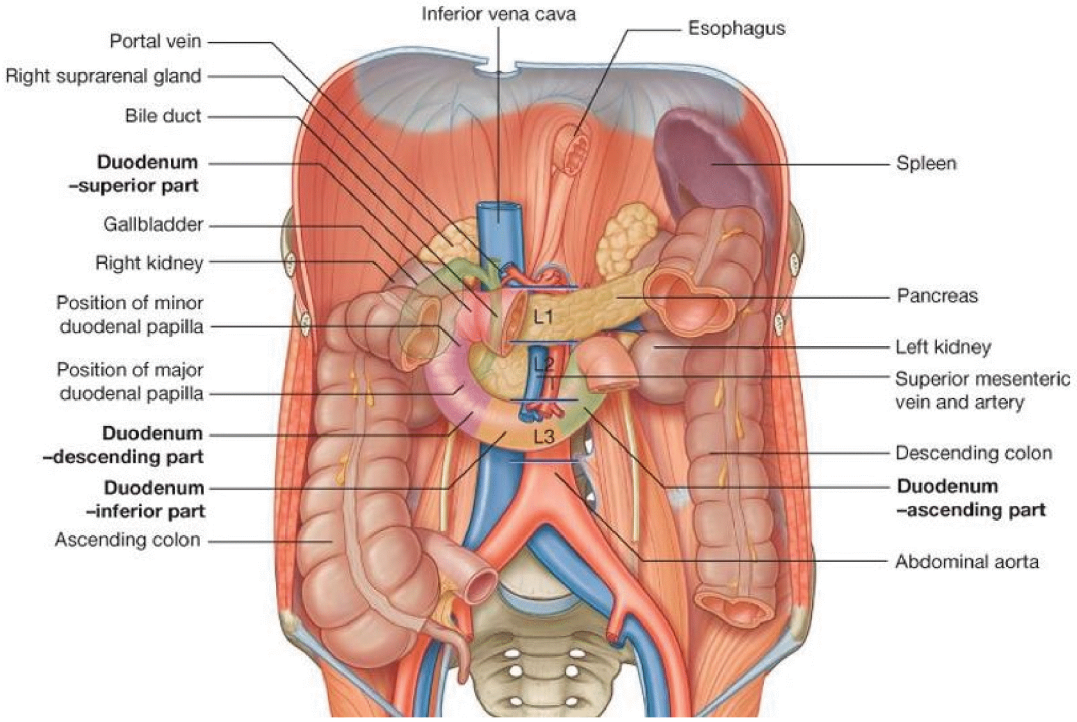
It is related posteriorly to the common bile duct, portal vein, inferior vena cava, and gastroduodenal artery; anteriorly to the quadrate lobe of the liver; superiorly to the epiploic foramen; and inferiorly to the head of the pancreas.

The first 2.5 cm is intraperitoneal and covered by the same two layers of peritoneum that invest the stomach.

The hepatoduodenal portion of the lesser omentum attaches to the superior border of the duodenum while the greater omentum attaches to its inferior border.

The distal 2.5 cm is retroperitoneal and covered with peritoneum only on the anterior surface; thus, the posterior surface is in intimate contact with the bile duct, portal vein, and gastroduodenal artery.

The duodenum is separated from the inferior vena cava by a small amount of connective tissue.



Picture illustrating Parts of Duodenum & its relations.

The second (descending) portion (D2) is approximately 7.5 cm long. It extends from the neck of the gallbladder to the upper border of L4. D2 is crossed by the transverse colon and its mesocolon, and can be divided into supramesocolic segment and inframesocolic segment, both of which are entirely retroperitoneal and covered anteriorly by visceral peritoneum.

The first and the second portions of the duodenum join behind the costal margin slightly above and medial to the tip of the ninth costal cartilage and on the right side of L1. D2 forms an acute angle

with D1 and descends from the neck of the gallbladder anterior to the hilum of the right kidney, the right ureter, the right renal vessels, the psoas major muscle, and the edge of the inferior vena cava. D2 is related anteriorly to the right lobe of the liver, the transverse colon, and the jejunum. At about the midpoint of D2, the pancreaticobiliary tract opens into its concave posteromedial side. The right side is related to the ascending colon and the right colic flexure.

The third portion of the duodenum (D3, horizontal or inferior) is approximately 10 cm long, and extends from the right side of L3 or L4 to the left side of the aorta. D3 begins about 5 cm from the midline, to the right of the lower end of L3 at the level of the subcostal plane. It passes in a transverse pathway to the left, anterior to the ureter, right gonadal vessels, psoas muscle, inferior vena cava, lumbar vertebral column, and aorta, and ends to the left of L3.

The inframesocolic portion of the duodenum is covered anteriorly by the peritoneum. It is crossed anteriorly by the superior mesenteric vessels. Near its termination, it is crossed by the root of the mesentery of the small intestine. D3 is related superiorly to the head and uncinate process of the pancreas.

The inferior pancreaticoduodenal artery lies in a groove at the interface of the pancreas and the duodenum. Anteriorly and inferiorly, this part of the duodenum is related to the small bowel, primarily to the jejunum.

D2 and D3 are overlapped by the head of the pancreas, and so there is a pancreatic bare area of the duodenum not covered by peritoneum. A second bare area exists on the anterior surface of D2, where the transverse colon is attached. With pancreatic cancer or pancreatitis, the pancreas and the mesocolon with its middle colic artery may become firmly fixed. The anatomic entities responsible for duodenal fixation are the pylorus, the superior mesenteric vessels, the ligament of Treitz, and the peritoneum.

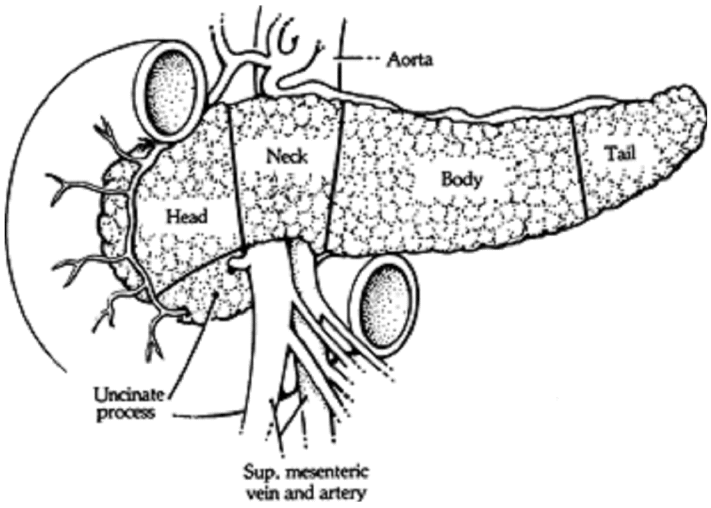
The fourth portion of the duodenum (D4, ascending) is approximately 2.5 cm long and extends from the left side of the aorta to the left upper border of L2, and is directed obliquely upward, slightly to the left. It ends at the duodenojejunal junction (flexure) at the level of L2, at the root of the transverse mesocolon. This junction occurs approximately 4 cm below and medial to the tip of the ninth costal cartilage.

The fourth portion is related posteriorly to the left sympathetic trunk, the psoas muscle, the left renal and gonadal vessels, the inferior mesenteric vein, the left ureter, and the left kidney. The upper end of the root of the mesentery also attaches here. The duodenojejunal junction is suspended by the ligament of Treitz, a remnant of the dorsal mesentery, which extends from the duodenojejunal fl exure to the right crus of the diaphragm.

The suspensory ligament usually inserts on the duodenal fl exure, and D3 and D4. It may insert on the flexure only, or on D3 or D4. There may also be multiple attachments.

Pancreas:

The pancreas is an elongated organ with a lobular surface extending from the C loop of the duodenum to the hilum of the spleen. The gland is retroperitoneal and divided topographically into the uncinate, head, neck, body, and tail.



Parts of pancreas

The head lies to the right of the second lumbar vertebra in apposition to the duodenum. The uncinate process lies posterior to the head, extends medially to lie beneath the superior mesenteric vessels, and contacts the vena cava posteriorly.

The neck is a narrowed 2.0–2.5-cm portion of the gland that lies directly over the superior mesenteric vein and beneath the first portion of the duodenum. Rarely are there vascular attachments between the neck and the superior mesenteric vein. Development of the plane between these structures is a critical step in performing pancreatic resection.

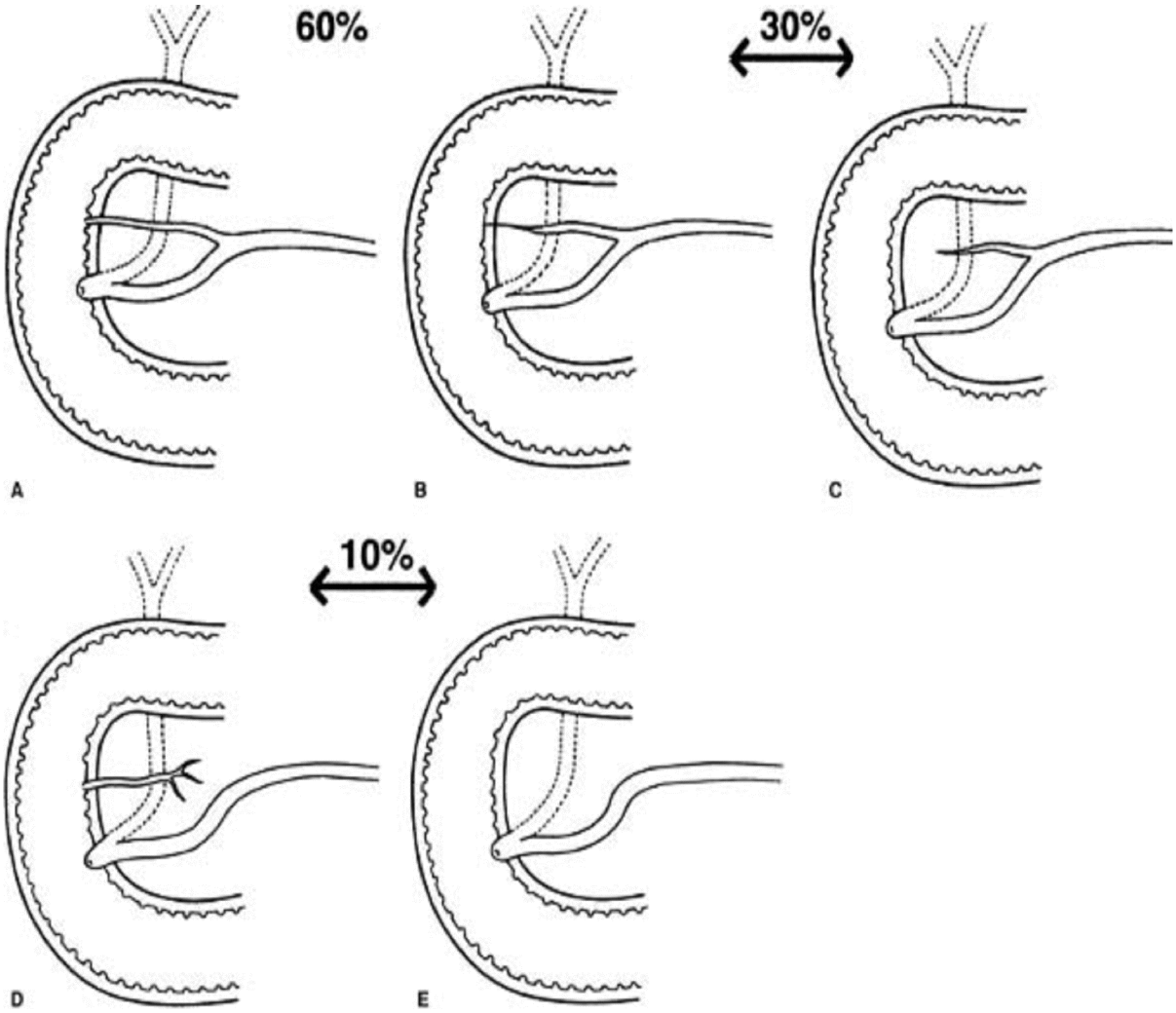
The body extends across the second lumbar vertebral body, anterior to the left kidney and tapers slightly cephalad into the tail, terminating in or near the splenic hilum.

The anterior surface of the pancreas is covered by the parietal peritoneum, which separates the gland from the stomach. The inferior surface abuts the transverse mesocolon and is closely associated with the duodenojejunal junction. The splenic vein is imbedded by varying degrees in the posterior surface of the pancreas, and is occasionally completely encased by pancreatic tissue. The splenic artery runs a tortuous course along the superior edge of the gland.

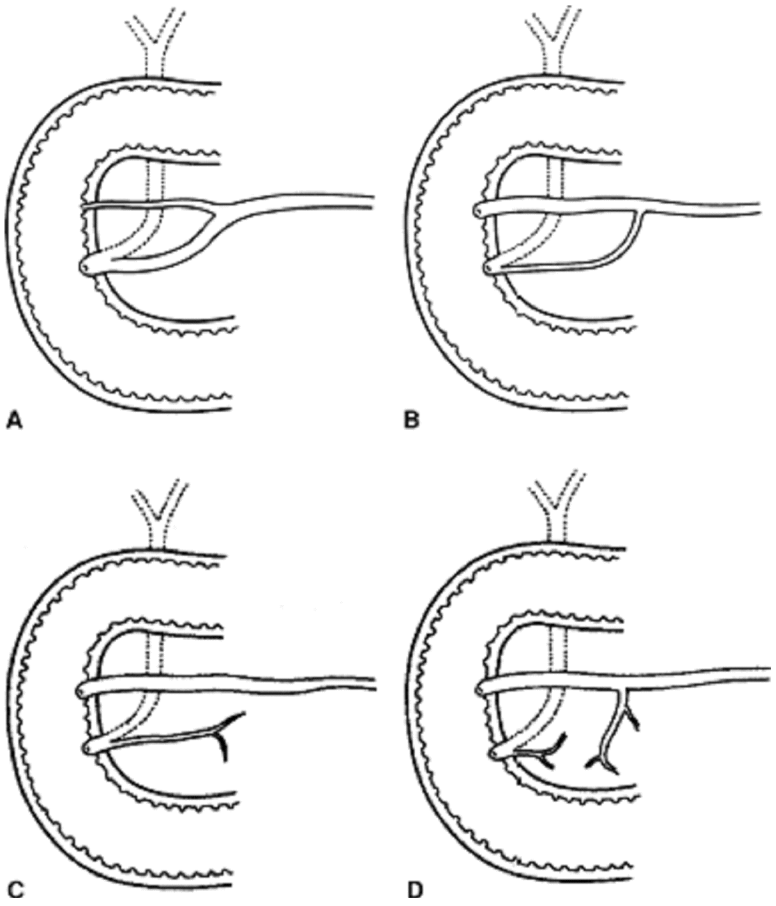
Pancreatic Ducts:

The pancreatic ductal system is formed by the fusion of two embryologic ductal systems. The main pancreatic duct originates in the tail and travels longitudinally through the gland to the head, where in most cases; it turns slightly caudally and posteriorly to its termination in the duodenal papilla. At the point of deviation of the duct, an accessory duct travels more directly through the head to the duodenum, terminating in the minor or lesser papilla.

In a minority (10%) of patients, the ductal systems fail to fuse, and the accessory duct serves as the major drainage system for the gland. This anatomic variant constitutes the pancreas divisum. Tributaries to the main duct are generally at right angles to it, an arrangement upheld in the secondary and tertiary ducts as well.



Variations in Ductal anatomy, Degrees of suppression of accessory duct



Degrees of suppression of main Pancreatic Duct

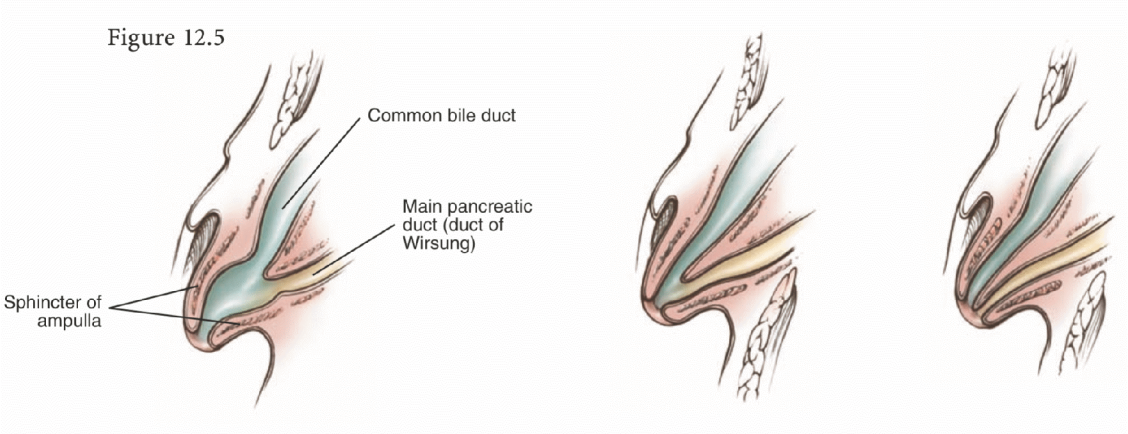
Ampulla of Vater:

The pancreatic duct and the bile duct terminate in the duodenum at the ampulla (papilla) of Vater. The major papilla is an elevation of the duodenal mucosa at the point where the common bile duct and the pancreatic duct enter the duodenum. It is usually 7–10 cm from the pylorus, but may be as close as 1.5 cm or as distant as 12 cm.

The bile duct and the pancreatic duct typically join to form a common channel of varying length (the ampulla) within the papilla. In

a minority of cases, the two ducts enter the duodenum separately through the papilla, in which case, the ampulla is said to be absent. In rare instances, the ducts may enter the duodenum via separate papillae. The minor papilla is present in approximately 70% of patients and lies slightly anterior and cephalad (approximately 2 cm) to the major papilla.

The following classification Classifies common channel in to 3 types:



Type 1: The pancreatic duct opens into the common bile duct at a variable distance from the opening in the major duodenal papilla. The common channel may or may not be dilated (85%).

Type 2: The pancreatic and bile ducts open close to one another but separately on the major duodenal papilla (5%).

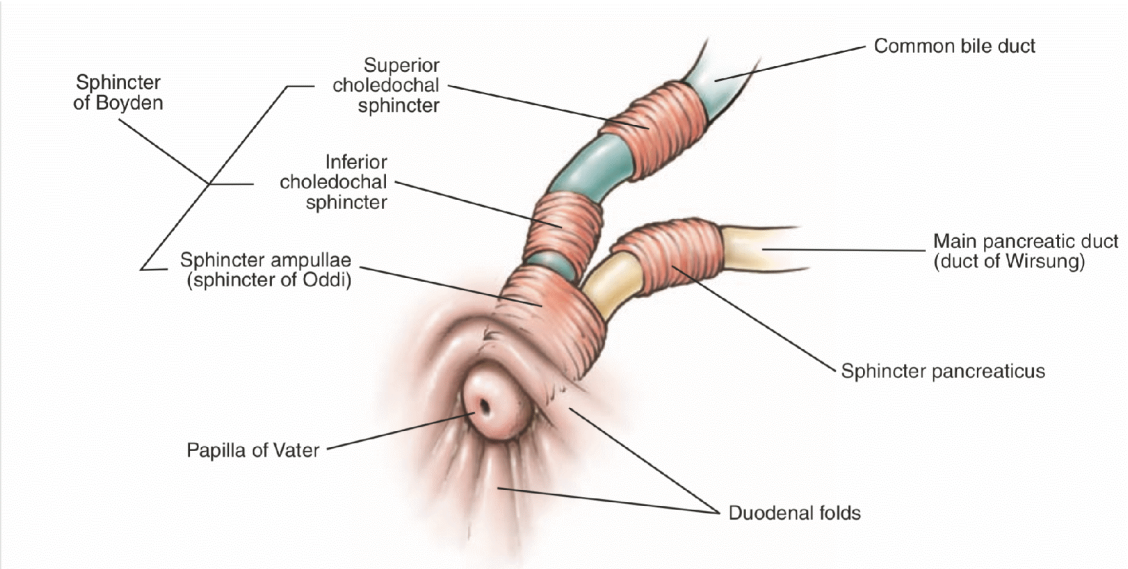
Type 3: The pancreatic and bile ducts open into the duodenum at separate points (9%).

Major Duodenal Papilla:

Endoscopically, the major papilla may be recognized at the junction of the transverse and the longitudinal fold of the duodenal mucosa (plica longitudinalis), which forms a T configuration. The orifice of the papilla is often filled with villus-like projections called valvulae.

Like the papilla of Vater, the sphincter of Oddi at the duodenal end of the pancreatic and common bile ducts is misnamed. By priority of description, it should have been named after Francis Gilsson (1654), who described annular fibers around the entire intramural portion of the bile duct and believed that they guarded the opening against the reflux of duodenal contents.

The sphincter lies within the ampulla and is a complex series of muscular valves that work in conjunction with hormonal and neural signals to control secretion from the pancreatic and bile ducts. This sphincteric mechanism constitutes the narrowest portion of both, the biliary and pancreatic ductal systems and is the most common site of stone-related obstruction.



Minor Duodenal Papilla:

The minor papilla is about 2 cm cranial and slightly anterior to the major papilla. The accessory pancreatic duct (of Santorini) opens through the minor papilla, which is smaller and less easily identified than the major papilla. The most useful landmark is the gastroduodenal artery, behind which lie the accessory duct and the minor papilla.

Duodenal dissection for gastrectomy should end proximal to the artery. The minor papilla may contain either no duct at all or only a microscopic, tortuous channel. A true sphincter (of Helly) is rarely present. In about 10% of patients, the duct of Santorini is the only duct draining most of the pancreas. Accidental ligation of this duct, together with the gastroduodenal artery, could result in catastrophic pancreatitis.

BLOOD SUPPLY:

Arterial Supply-

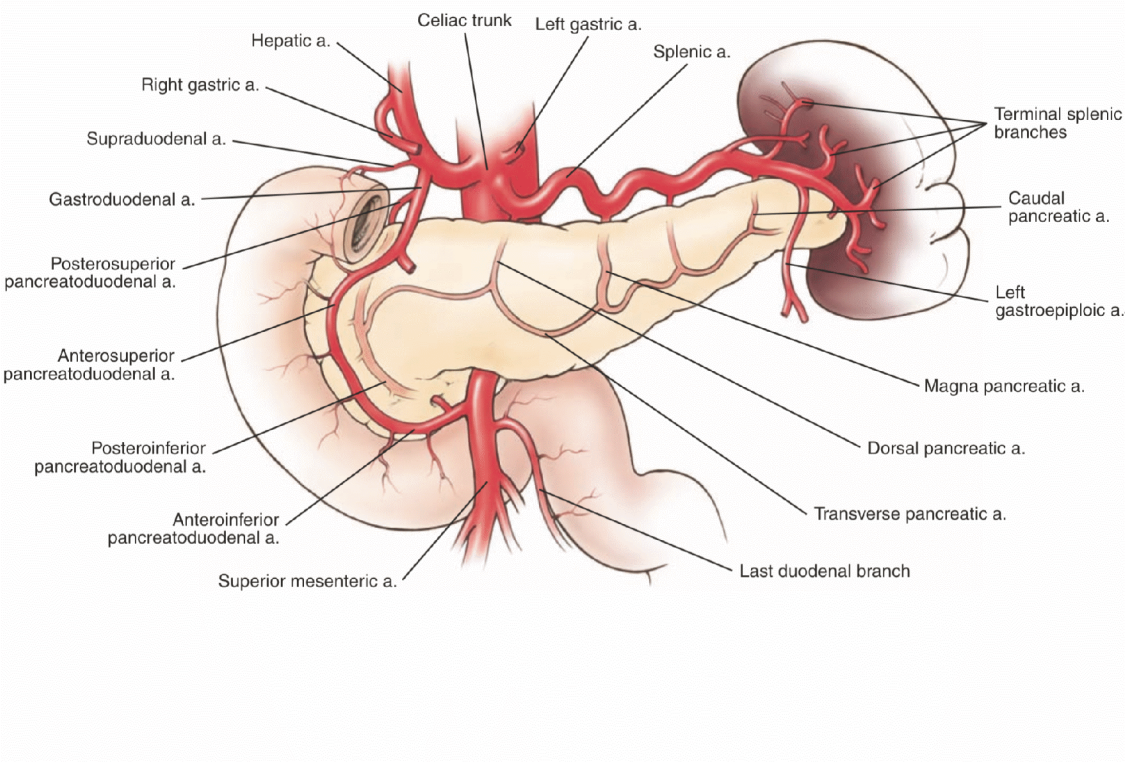
The blood supply of the pancreas and the duodenum is confusing because of the diverse possibilities of origin, distribution, and individual variations. This is especially true in the case of the blood supply of D1.

D1 is supplied by the supraduodenal artery and the posterosuperior pancreaticoduodenal branch of the gastroduodenal artery (retroduodenal artery of Edwards, Michel, and Wilkie), which is a branch of the common hepatic artery. In many patients, the upper part of the first 1 cm is also supplied by branches of the right gastric artery. In some patients, there may be separate small branches to the superior and posterior aspects of D1. These can be properly called the supraduodenal and the retroduodenal, respectively. Each may arise separately or in various combinations. It is preferred, therefore, that the term retroduodenal not be used as a synonym for the posterosuperior pancreaticoduodenal artery, the principal role of which is to supply the second part of the duodenum and the pancreatic head.

After giving rise to the supraduodenal, retroduodenal, and posterosuperior pancreatoduodenal branches, the gastroduodenal artery descends between the first part of the duodenum and the head of the pancreas. It terminates by dividing into the right gastroepiploic and anterosuperior pancreatoduodenal arteries, both supplying twigs to this part of the duodenum.

The remaining three parts of the duodenum are supplied by an anterior and a posterior arcade. Pancreatic and duodenal branches emanate from these arcades.

Those supplying the duodenum are called arteriae rectae, and they may be embedded in the substance of the pancreas.

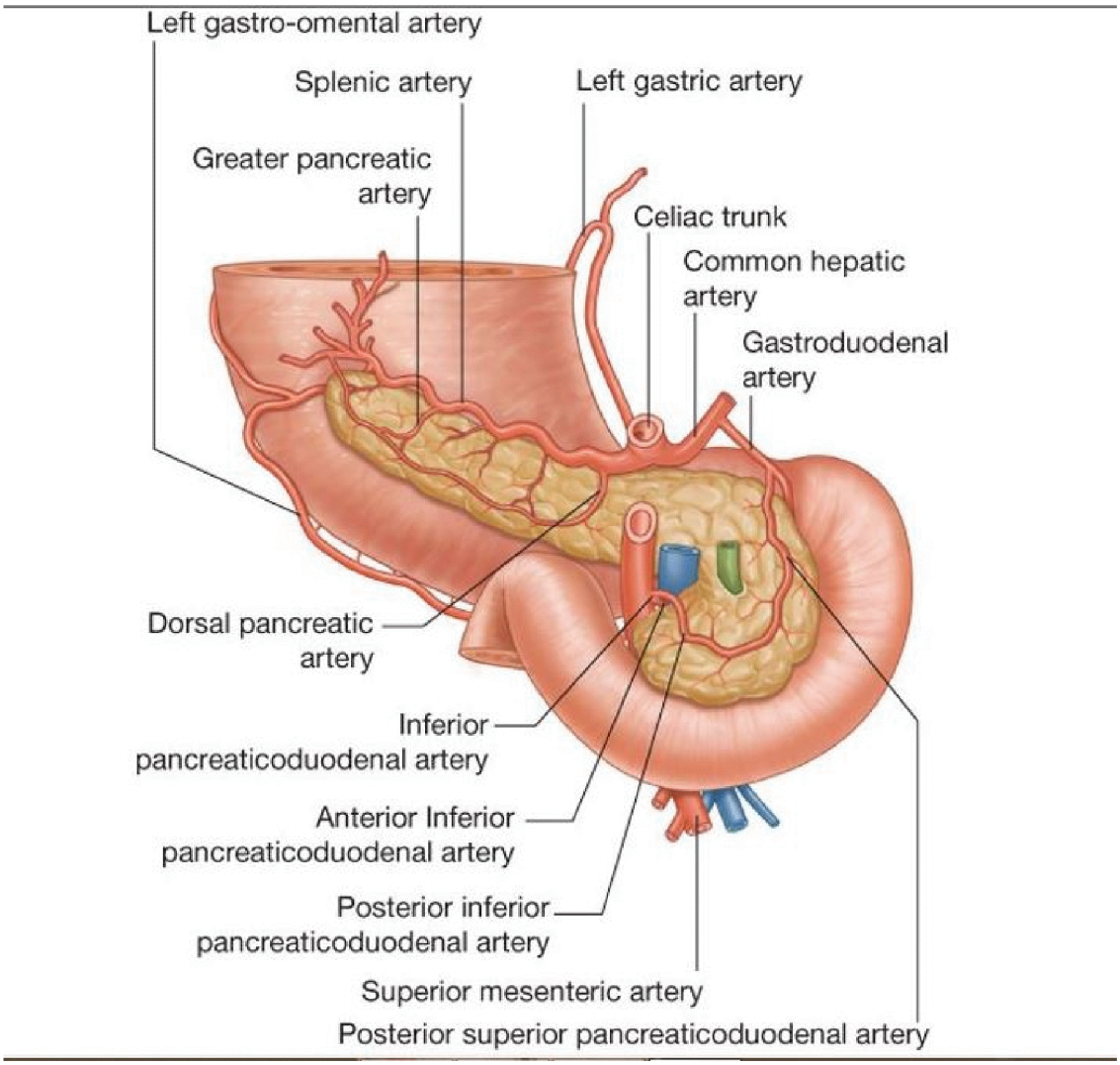


Blood supply of duodenum & pancreas.

The pancreas has an extremely rich blood supply from varied sources, most major of which comes from the branches of the gastroduodenal, superior mesenteric, and splenic or celiac arteries. Numerous smaller tributaries arise from the splenic, hepatic, and gastroduodenal arteries.

The gastroduodenal artery is critical to any discussion of pancreatic arterial anatomy. It arises from the hepatic artery approximately 2 cm from its origin and passes medially and inferiorly to the common bile duct, where it slips beneath the first portion of the duodenum and across the anterior surface of the pancreatic head.

The anterosuperior pancreatoduodenal artery is a continuation of the gastroduodenal artery and passes downward and through the sulcus between the duodenum and the pancreas. It continues and anastomoses with the inferior pancreatoduodenal artery along the medial surface of the duodenum.



Posterior Surface of pancreas – Arterial arcade

The posterosuperior pancreatoduodenal artery branches from the gastroduodenal artery at the superior border of the pancreas and traverses posteriorly behind the pancreas, crossing medially to anastomose with the posteroinferior pancreatoduodenal artery.

Two other major arterial branches supplying the body and the tail of the pancreas are the inferoanterior and the inferoposterior pancreatoduodenal arteries. These two arteries arise from the superior mesenteric artery, or one of its primary branches, and form an arcade that supplies the duodenojejunal junction and portions of the pancreatic neck.

The superior dorsal pancreatic artery is somewhat inconsistent, but when present, arises from either the celiac or the splenic artery, and courses along the superior border of the body and the tail of the pancreas.

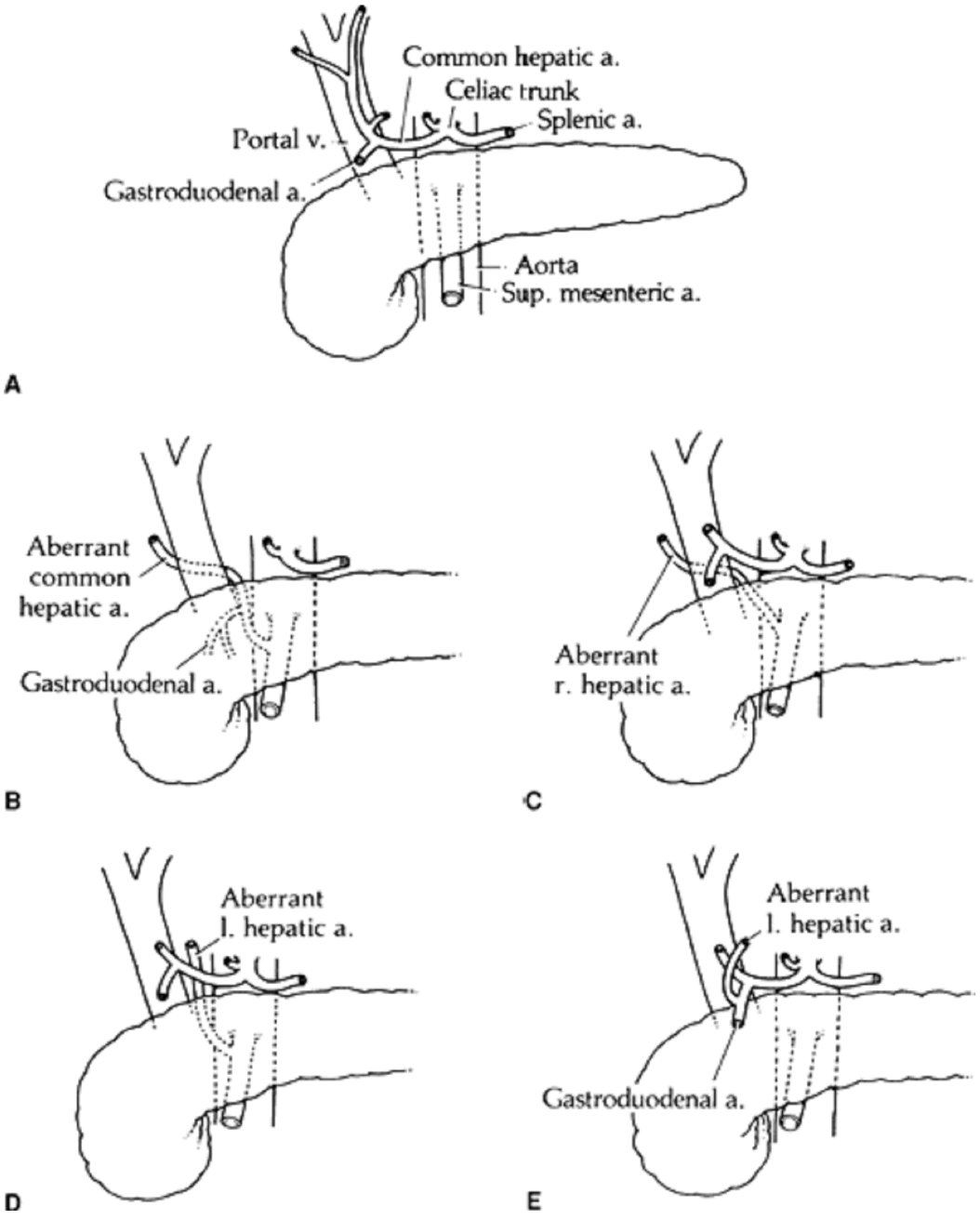
The inferior transverse pancreatic artery is fairly constant and arises from either the superior mesenteric artery, the superoanterior pancreatoduodenal artery, or the superior dorsal pancreatic artery, and passes through the body of the pancreas along the inferior margin of the gland.

The body and the tail of the gland receive numerous branches from the splenic artery as it courses along the superior border of the gland.

There are surgically significant arterial anomalies. The most common major anomaly is the origin of the right hepatic artery from the superior mesenteric artery. When this occurs, the artery passes through or posterior to, the pancreatic head and enters the porta hepatic, posterior and lateral to the common bile duct.

More rarely, the common hepatic artery may arise from the superior mesenteric artery and travel anteriorly, posteriorly, or through the pancreatic substance to the porta hepatis. Recognition of these anomalies is critical during pancreaticoduodenal resection and certain hepatobiliary procedures.

When either artery travels posterior to the head of the gland, it can usually be dissected free and preserved. When an anomalous artery passes through the substance of the gland, it will be sacrificed and may need to be reconstructed via reimplantation in the common hepatic artery or the gastroduodenal artery, or grafted into the aorta.



Aberrant common, right & Left hepatic arteries anomolies

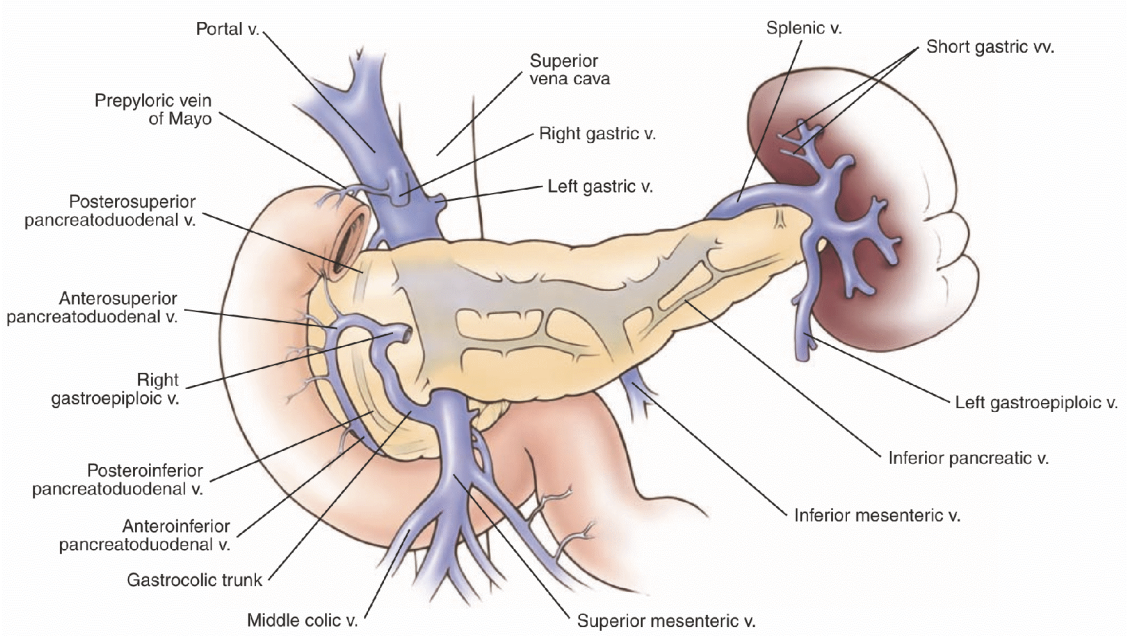
A sound principle is to test clamp these vessels with noncrushing vascular clamps, prior to ligation.

Veins:

The subpyloric veins, which are the veins of the lower first part of the duodenum and the pylorus, usually open into the right gastroepiploic veins. The upper first part of the duodenum is drained by suprapyloric veins, which open into the portal vein or the posterosuperior pancreatoduodenal vein. Anastomoses between subpyloric and suprapyloric veins pass around the duodenum.

One of these has been said to mark the site of the pylorus (prepyloric vein of Mayo). However, it is not a consistent indicator of the location of the pylorus.

The venous arcades draining the duodenum follow the arterial arcades and tend to lie superficial to them. The anterosuperior vein drains into the right gastroepiploic vein. The posterosuperior vein usually passes behind the common bile duct to enter the portal vein.



Venous drainage of pancreas & Duodenum

The inferior veins can enter the superior or the inferior mesenteric vein, the splenic vein, or the first jejunal branch of the superior mesenteric vein. The veins may terminate separately or by a common stem.

The superior mesenteric vein, the splenic vein, and the portal vein are intimately associated with the pancreas. The anterior surface of the superior mesenteric vein passes directly beneath the neck of the gland and receives branches only rarely.

The splenic vein receives numerous branches from the body and the tail of the pancreas along its course to its junction with the superior mesenteric vein, beneath the neck of the gland.

The inferior mesenteric vein is constant in its course, but variable in its drainage into either the splenic vein or the superior mesenteric vein. The left gastric (coronary) vein is constant in its course along the lesser curve of the stomach, but terminates at the splenoportal junction or along the portal vein some distance from the splenoportal junction. This trunk is ligated for exposure of the anterior surface of the pancreas.

The head of the gland is drained via an arcade of venous structures forming the anterosuperior pancreaticoduodenal vein and the anteroinferior pancreatoduodenal veins. The former receives numerous duodenal tributaries and passes upward and medially from the duodenojejunal junction to enter the gastrocolic trunk.

The latter passes medially through the substance of the pancreas, joining a jejunal tributary of the superior mesenteric vein. The posterior aspect of the head is drained by two significant veins, the posterosuperior and posteroinferior pancreatoduodenal veins.

The superior vein courses behind the bile duct and wraps medially to drain directly into the portal vein, and the inferior vein

passes around the superior mesenteric vein and drains into its first duodenojejunal tributary.

The right gastroepiploic vein courses along the greater curvature of the stomach between the two leaves of the gastrocolic ligament and curves downward where it joins the superior mesenteric vein, just below the neck of the pancreas. The right gastroepiploic vein is significant because it is joined, near its insertion into the superior mesenteric vein, by the inferosuperior duodenal vein and one or more colic veins. This short but relatively broad attachment is called the gastrocolic trunk.

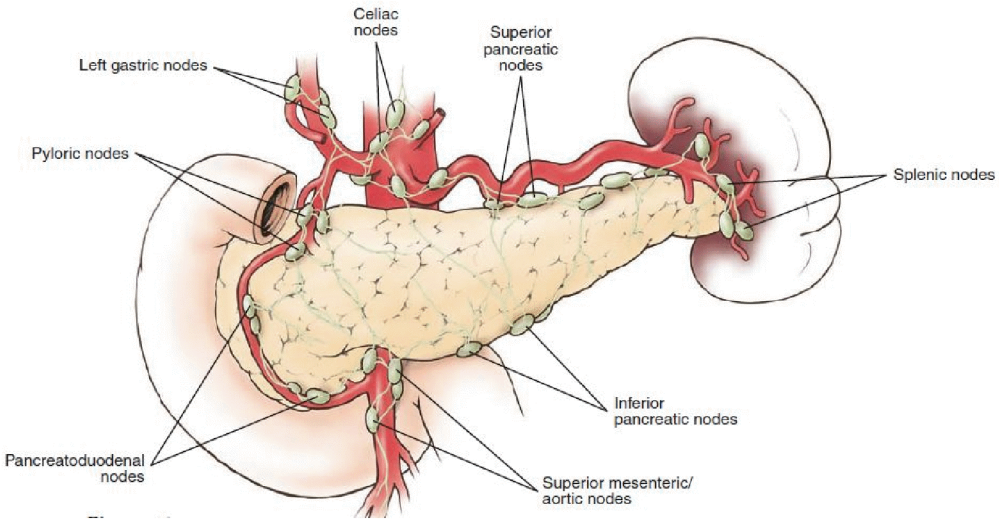
The superior portion of the neck and body of the pancreas is drained through multiple short tributaries into the splenic vein. The inferior portions are drained by a relatively constant inferior pancreatic vein, which courses along the inferior border of the body of the gland, and commonly empties into either side of the superior mesenteric vein.

Major anomalies of the pancreatoduodenal venous drainage are unusual. However, particular care must be paid to rare but anomalous connections of the neck of the pancreas to the portal vein, via short tributaries. In addition, when mobilizing the pancreas from the anterior

surface of the superior mesenteric vein, short but relatively wide tributaries directly into the vein from the uncinate process are often encountered and must be evaluated and ligated with care to avoid avulsing them from the superior mesenteric and/or portal veins.

Lymphatic drainage:

The duodenum is richly supplied with lymphatic vessels. They originate as blind ending vessels (lacteals) in each villus of the mucosa. These vessels form a plexus in the lamina propria and pierce the muscularis mucosae to form a second submucosal plexus. Yet another lymphatic plexus lies between the circular and longitudinal layers of the muscularis. Collecting trunks pass over the anterior and the posterior duodenal wall toward the lesser curvature to enter the anterior and posterior pancreaticoduodenal lymph nodes.



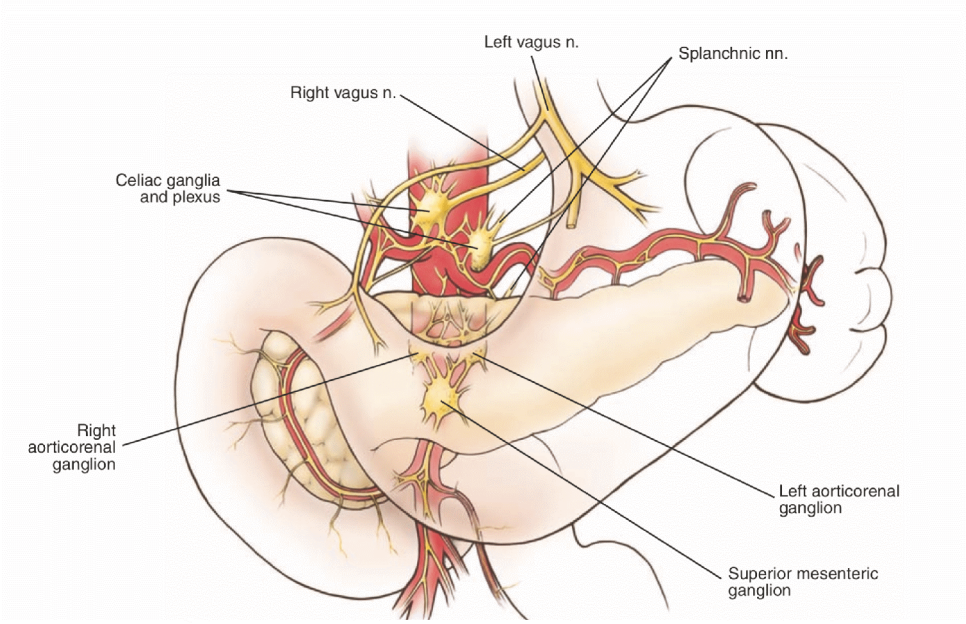
Lymphatic Drainage of Pancreas

The anterior extramural collecting ducts drain into the nodes anterior to the pancreas. The posterior ducts pass to the nodes posterior to the head of the pancreas. The ducts follow the veins and the arteries to the nodes related to the superior mesenteric artery.

Nerve Supply:

The preganglionic parasympathetic fibers in the plexuses are carried initially by the vagus nerves. The postganglionic sympathetic fibers arise from cell bodies located in the celiac and superior mesenteric plexuses, and perhaps, the upper thoracic sympathetic chain ganglia also. The extrinsic nerve supply to the duodenum probably includes contributions that leave the anterior hepatic plexus close to the origin of the right gastric artery. In unusual cases, nerves from the

hepatic division of the anterior vagal trunk give rise to one or more branches that innervate the first part of the duodenum. In most specimens, some branches can be traced upward to the gastric incisura.



Innervation of Pancreas

Innervation of the pancreas largely accompanies the vascular structures. Sympathetic fibers travel via the celiac ganglion, where preganglionic efferent fibers pass before reaching the pancreas. The sympathetic efferent fibers are located in the dorsal root ganglia T10 through T12 which is an important concept in consideration of operations to relieve pain from chronic pancreatitis or pancreas exocrine cancer. The parasympathetic fibers invade the pancreas via the vagus nerve and have their cell bodies in the brain.

History of PancreaticoDuodenectomy

The history of the pancreaticoduodenectomy extends from the late 19th century with its ominous prohibitive mortality to its current stage where mortality has been reduced to less than 5%. The maturation of the procedure, which we call now as pancreaticoduodenectomy, has been punctuated by the involvement of several giants of surgical heritage. This highly demanding procedure requires the highest level of surgical training and excellent technical skills. Here we go with the history of pancreaticoduodenectomy.

In 1899 **William Halsted** reported the first successful resection for ampullary tumour by excising portions of the duodenum and pancreas in a patient operated upon for gall stones.

In 1907; Desjardins performed a radical resection of the duodenum and head of pancreas in **human cadavers** in two stages. He also suggested implantation of a pancreatic stump in the bowel.

In 1908; Sauvé performed a one-stage procedure in **cadavers** with various ideas of dealing with the pancreatic stump including suturing it to the abdominal wound to create a fistula.

In 1912; Walter Kausch first attempted en bloc resection of the majority of the duodenum & significant portion of the pancreas & established continuity with a pancreaticoduodenostomy.

In 1914 Hirschel first reported one-stage partial resection; He excised parts of the duodenum, ampulla, head of pancreas and the lower part of the common bile duct. This procedure did not involve complete resection of the duodenum or the pancreas.

In 1922 Tenani carried out a successful two-stage resection for ampullary carcinoma. In the first stage, he performed a posterior gastro enterostomy and choledochoduodenostomy to the lower duodenum. During the second stage, he excised portions of the duodeunum, head of the pancreas wide of the growth and established continuity with a pancreaticoduodenostomy to the lower duodenum.

In 1935 **Allen Oldfather Whipple** reported three **successful two stage** en bloc resections of the head of the pancreas and the duodenum from **Columbia Presbyterian Hospital in NewYork**.

The two-stage procedure included a radical resection of the duodenum and head of the pancreas for ampullary cancer. The third

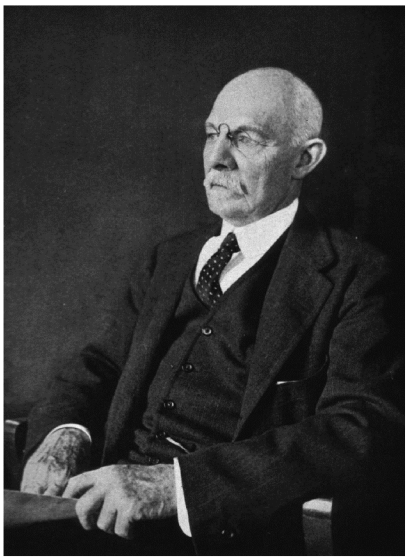
patient underwent a total duodenectomy and excision of a large portion of the head of the pancreas.

This was the **first reported case** of complete excision of the duodenum and a large portion of the head of pancreas.

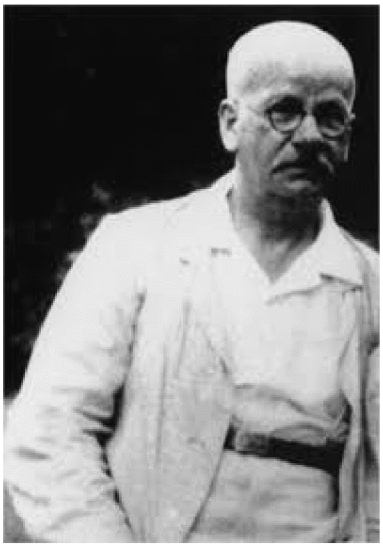
In 1940 Henrick Dam discovered Vitamin K; a Danish physiologist, which had reduced the bleeding tendency in jaundiced patients.

Allen O Whipple, in **1940 reported first one-stage procedure** for complete excision of the head of the pancreas and the entire duodenum (Pancreaticoduodenectomy).

In the same year 1940 Hunt added pancreaticojejunostomy to avoid leakage of the pancreatic stump.



William Stewart Halsted M.D(1852-1922)



Walther Kausch(1867-1928)

Allen O Whipple(1881-1963)

In 1946 Allen O Whipple published his 10-year experience of radical excisions of the head of pancreas and duodenum. He went on to summarise the significant steps of the one-stage procedure and advocated a one-stage procedure, which included:

(i) Complete resection of the duodenum and the head of pancreas;

(ii) Restoration of pancreatico-enteric continuity by anastomosing the pancreatic duct to a jejunal loop;

(iii) Performing a choledochoenterostomy rather than using the gallbladder as a conduit to avoid ascending biliary tract infections and stenosis.

Whipple performed a total of 37 pancreaticoduodenectomies in his career of which 30 were for periampullary carcinoma and 7 for chronic pancreatitis.

In most of his surgeries, he did pancreatic reconstruction with Jejunum.

In 1963, Allen O Whipple published his reminiscences of the procedure that bears his name.

In the history of pancreaticoduodenectomy, Most of the early surgeons namely Kausch, Hirschel and Tenani resected only portions of the duodenum and pancreas. While **Allen O Whipple** was the **first surgeon** to perform a **complete resection of the duodenum and head of the pancreas** in his initial two-stage (1935), and subsequent one-stage (1940) procedures which bears his name.

Two types of Pancreaticoduodenectomy have been described, one is Classical whipple's operation, other one is Pylorus preserving Pancreaticoduodenectomy (PPPD).

Recently popularised technique in 1978 by Traverso and Longmire in which the whole stomach and 2.5 cm of the duodenum are preserved, the gastrointestinal continuity is restored by duodenojejunostomy; while rest of the procedure remains as of classical whipples.

By this procedure the postgastrectomy syndrome (dyspepsia, postprandial dumping, diarrhoea, nausea and vomiting) is reduced and better functional results have been achieved. However it has been linked with a major drawback, that is delayed gastric emptying

(DGE), which is responsible for prolonged hospital stay and increased associated morbidity.

Multiple options for reconstruction of pancreatic remnant after pancreaticoduodenectomy are available. The technique most commonly employed after pancreaticoduodenectomy is pancreaticojejunostomy(PJ), while in PJ many sub types had been described, mainly duct-to-mucosa anastomosis or an invagination technique. Recently a new novel type of reconstruction had been described by Peng et al in 2002, Binding Pancreaticojejunostomy, popularly known as Binding PJ. Peng claimed 0% PJ leak rate with this novel technique in his Prospective Randomised controlled study, comparing conventional PJ v/s Binding PJ. Since then it had been used as a method of reconstruction in many centres.

Duct to mucosa PJ

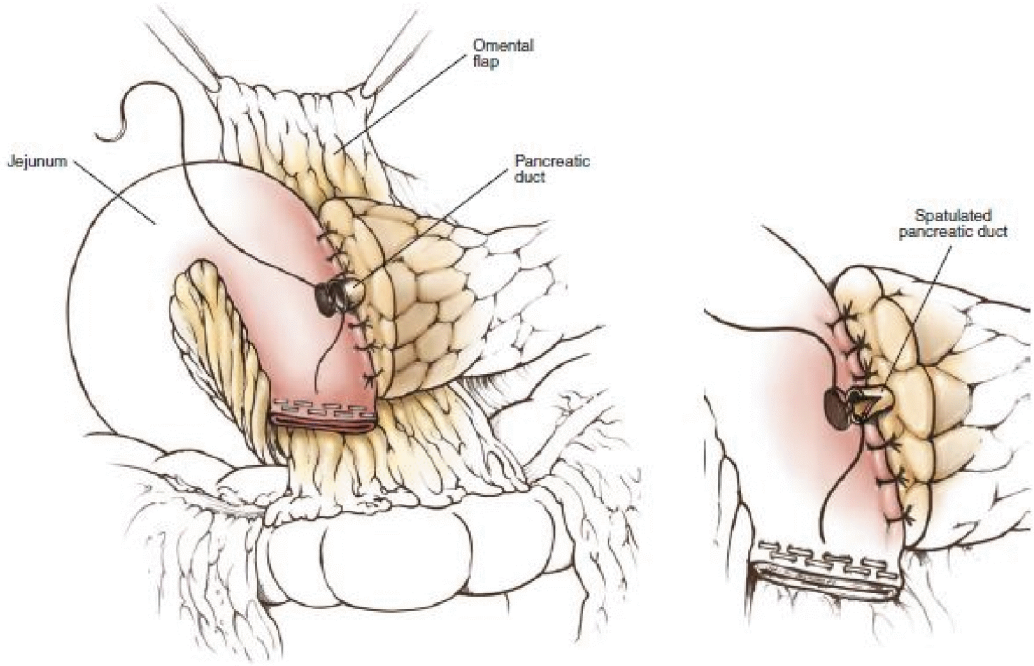
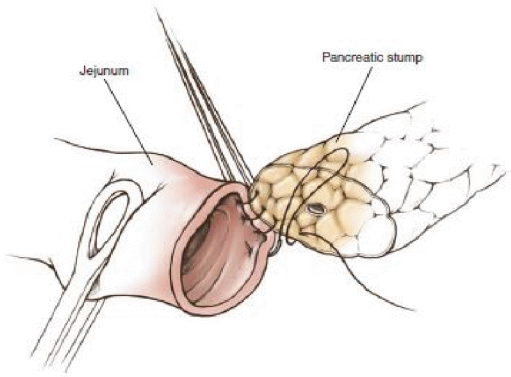
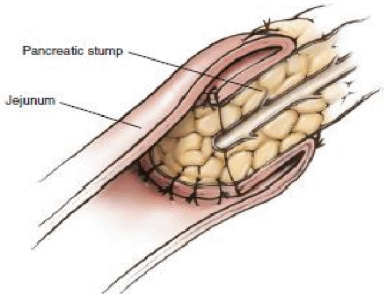
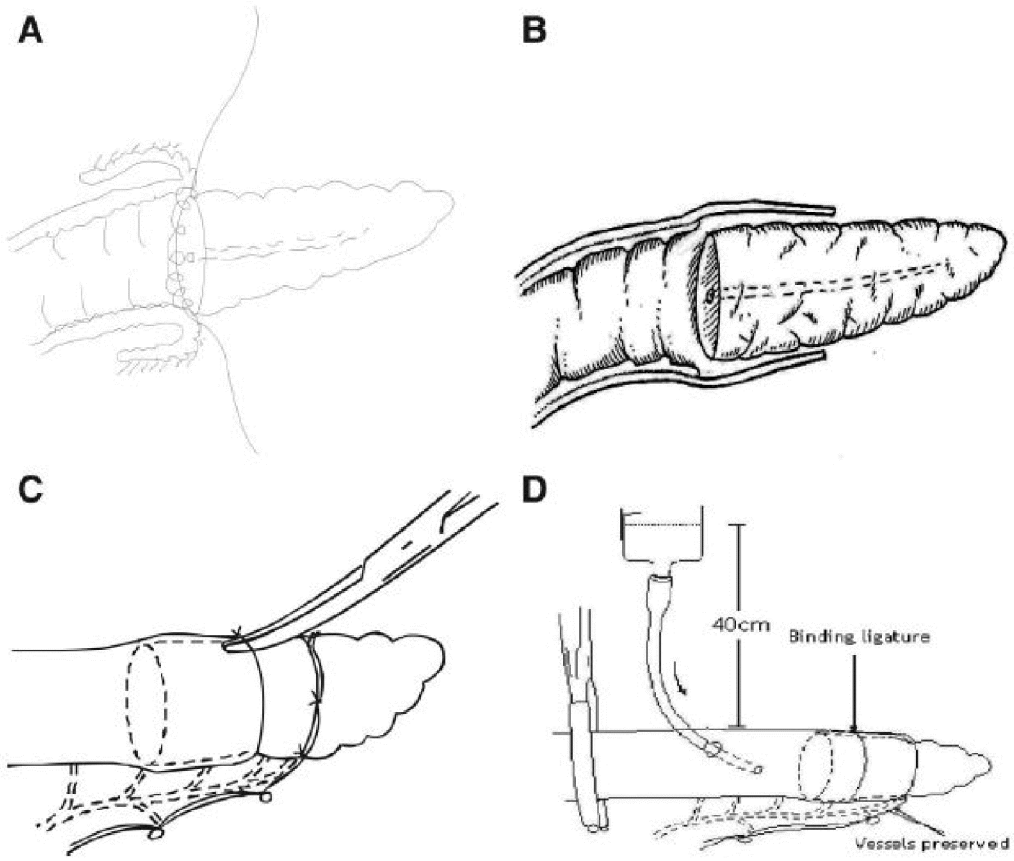


Figure 12.24





Dunking type of PJ



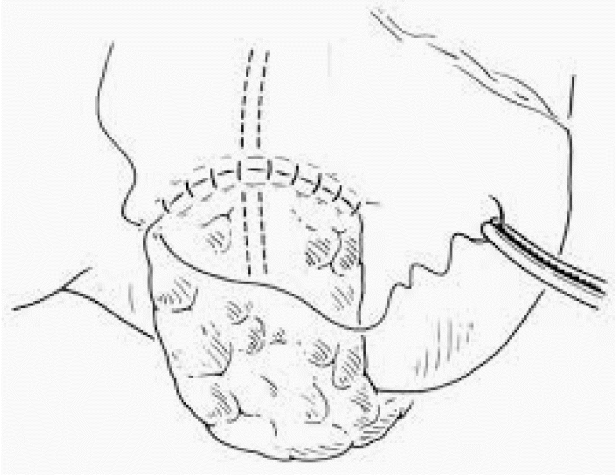
Binding Pancreaticojejunostomy

The recently popularized option for pancreatic anastomosis of remnant is pancreaticogastrostomy (PG), a technique first described clinically by Waugh and Clagett in 1946. In PG, different subtypes had been described, like duct to mucosa anastomosis, Dunking, Binding technique, the pancreatic reconnection is the most problematic anastomosis and is responsible for the majority of the morbidity and mortality associated with the procedure. Several explanations regarding the protective role of PG over PJ have been described in the literature. Some authors have suggested that

- Pancreatic secretions may be less corrosive to the stomach after PG than to the digestive tract after PJ, because the acidity of gastric secretions inactivates the pancreatic enzymes. In PJ, the pancreatic enzymes are activated by alkaline biliary and enteric secretion.

- Gastric and pancreatic secretion is easily diverted with a nasogastric tube after PG, and PG reconstruction may divert potential pancreatic fistulas away from major blood vessels. In PJ, complex fistulas may form with leakage of biliary and pancreatic secretion.

- Other advantages are the thickness and blood supply of the gastric wall, its proximity to the pancreas.



Duct to Mucosa PG

Pancreatic Stump Being Sutured to Posterior wall of Stomach with a stent in Pancreatic Duct

Each one had been associated with mortality and morbidity. The morbidity & mortality following PD were significantly reduced, by improvement of surgical skills & perioperative care. The mortality rate after PD had been reduced to less than 5% because of advances in Peri-operative management. Although the mortality rate have been reduced, the morbidity rate remains at a high level with post operative pancreatic fistula (POPF) as the most common and challenging complication.

Many Risk factors had been associated with development of Pancreatic Fistula, Disease related risk factors are a soft gland or diagnoses of ampullary, duodenal, cystic, or islet cell pathologies increases the risk of Fistula development by up to 10-fold. Pancreatic duct size is also crucial, with small ducts up to 3 mm in diameter conferring increased risk of Fistula.

As for patient-related risk factors which have not been proven risk factors are older age, male gender, coronary artery disease, jaundice, and low creatinine clearance. Neoadjuvant therapy when given appears to reduce the risk of fistula.

Operative risk factors include blood loss higher than 1000 mL and longer operative time. In summary, a successful pancreaticoenteric anastomosis requires a tensionfree anastomosis with properly placed and tied sutures, preserved blood supply to the pancreatic remnant and jejunum (In PJ), and unobstructed flow from the pancreas into the gastrointestinal tract, whatever the chosen technique may be.

Neither internal stenting nor creation of an isolated Roux loop has been found to positively affect fistula rate.

Other complications are delayed gastric emptying, biliary fistula, Gastro-enteric anastomosis leakage, Intraperitoneal haemorrhage, Fluid collection, Abscess, Acute pancreatitis, wound infection, Dehiscence, Pulmonary Infection. They often contribute significantly to prolonged hospitalization and mortality.

REVIEW OF LITERATURE

Pancreaticoduodenectomy had become routine procedure at specialized high volume centres, due to improved peri-operative management, appropriate selection of patients, improved surgical skills, and development of multidisciplinary teams dedicated to the care of pancreatic patients had reduced the mortality rate to less than 5%, which was around 30% three decades back.

As described before the main complication after pancreaticoduodenectomy is pancreatic fistula which contributes majorly to post operative morbidity.

Whether the type of anastomosis after PD Influences the development of POPF & Which type of reconstruction is safe?

Many Retrospective, RCT Studies and meta-analysis had been published, none of the publication clearly tells certain type of reconstruction is better than other.

Many retrospective studies suggest superiority of PG over PJ in terms of reduced POPF and other complications.

However, conflicting results have been reported from 8 prospective randomized controlled trials (RCTs) published from1995 to 2014. Only 3 RCTs have demonstrated a reduced rate of POPF after PG.

A prospective Randomized controlled trail which compared PG v/s PJ in 1995 by yeo et al had demonstrated that pancreatic fistula is a common complication after pancreaticoduodenectomy. The data do not support the hypothesis that PG is safer than PJ or that it is associated with a lower incidence of pancreatic fistula.

Pancreatic anastomosis	PG	PJ
Post operative Pancreatic Fistula	12.3%	11.1%

Table 3. POSTOPERATIVE FACTORS AND COMPLICATIONS

	PG (n = 73)	PJ (n = 72)	p Value
Delayed gastric emptying*	16 (22)	16 (22)	NS
Wound infection	14 (19)	11 (15)	NS
Pancreatic fistula†	9 (12)	8 (11)	NS
Cholangitis	4 (5)	6 (8)	NS
Pneumonia	5 (7)	2 (3)	NS
Intra-abdominal abscess	4 (5)	2 (3)	NS

This study does not show which method of reconstruction is better.

In 2007, Wing-Yiu Lui et al did a retrospective comparative study between pancreaticojejunostomy and pancreaticogastrostomy after PD. Total no of patients who had under gone PD were 377, out of which 188 had undergone PJ; while 189 had undergone PG.

Table 2. Observed morbidity and mortality following pancreaticoduodenectomy

	Overall ($n=377$)	PJ ($n=188$)	PG ($n=189$)	p
Surgical mortality	19 (5.0)	15 (7.9)	4 (2.1)	0.000
Complications				
Patients with complications	170 (45.1)	106 (56.4)	64 (33.9)	0.000
Pancreatic leakage	40 (10.6)	33 (17.6)	7 (3.7)	0.000
Wound infection	33 (8.8)	20 (10.6)	13 (6.9)	0.196
Delayed gastric emptying	43 (11.4)	22 (11.7)	21 (11.1)	0.857
Intra-abdominal abscess	35 (9.3)	29 (15.4)	6 (3.2)	0.000
Intra-abdominal bleeding	19 (5.0)	12 (6.4)	7 (3.7)	0.234
Upper gastrointestinal bleeding	21 (5.6)	12 (6.4)	9 (4.8)	0.493
Sepsis	15 (4.0)	13 (6.9)	2 (1.1)	0.004
Gastrojejunostomy leakage	2 (0.5)	2 (1.1)	0	0.248
Others	37 (9.8)	24 (12.8)	13 (6.9)	0.055

Wing-Yiu Lui et al observed in their study that there was a higher pancreatic leakage rate in PJ (17.6%) than in PG (3.7%). Pancreatic leakage-related mortality was higher in PJ (8/33, 24.2%) than in PG (0%).

Takano et al reported that the mortality rate related to pancreatic leakage was higher in PJ than in PG (22.2% vs. 0%).

They also noted one clear disadvantage of PJ, it is that once pancreatic leakage occurs, the activated pancreatic enzymes may lead to massive bleeding and, thus, to a life-threatening condition.

They concluded that for reconstruction of pancreatic remnant after PD, PG is a safer procedure than PJ and should therefore be the technique of choice amongst surgeons.

In 2002 Peng described a novel reconstruction method called as Binding Pancreaticojejunostomy & he conducted a Prospective Randomized controlled trail comparing Conventional Versus Binding Pancreaticojejunostomy after Pancreaticoduodenectomy.

A total of 217 patients were included in study, after randomisation 111 patients had undergone Conventional PJ; while 106 patients had undergone Binding PJ.

TABLE 3. Postoperative Course and Complications

	Binding Group (n = 106)	Conventional Group (n = 111)	*P*
Drain outputs (mL)	86.7 ± 36.3	83.8 ± 46.3	NS
Amylase (U/L) [mean (range)]	38.0 (0–762.5)	63.8 (8.6–1654.0)	0.0005
Abdominal complications [no. (%)]			
Pancreatic anastomotic leakage	0 (0)	8 (7.2)	0.014
Biliary leakage	7 (6.6)	6 (5.4)	NS
Gastric-enteric anastomotic leakage	1 (0.9)	1 (0.9)	NS
Delayed gastric emptying	4	3	NS
Pancreatitis	1	1	NS
Intraperitoneal hemorrhage	2	3	NS
Intraperitoneal abscess	0	3	NS
Ascites	1	2	NS
Wound infection	6	7	NS
Incision wound dehiscence	1	3	NS

In this study it showed that pancreatic anastomosis leakage rate was significantly lower with the bindingPJ technique (0%) than the conventional PJ (7.2%) technique. The incidence of postoperative complications and the length of hospital stay were also significantly better using the bindingPJ technique.

In 2011, John Isaac et al, did a retrospective analysis of prospectively collected data of 424 patients who underwent PG(239) and PJ(185).

Out of these patients, Post operative Pancreatic fistula developed in 55 patients in PG group(23.5%); while in PJ group 30 patients developed POPF(16.2%).

Table 6 The details of other complications and overall morbidity and mortality between the PG and PJ groups

Variables	PG, *n* = 239 (%)	PJ, *n* = 185 (%)	*P*-value
Other complications			
PPH	14 (5.9)	14 (7.6)	0.556
Chest infection	26 (11)	18 (9.7)	0.750
Respiratory failure	21(8.8)	9 (5)	0.130
Wound infection	17 (7)	11 (6)	0.696
Enteric leak	12 (5)	5 (2.7)	0.319
Bile leak	5 (2.3)	3 (1.6)	1.000
Renal failure	8 (3.3)	10 (5.4)	0.573
Delayed gastric emptying	2 (0.8)	5 (2.7)	0.248
AF	12 (5)	9 (5)	1.000
Re-laparotomy	10 (4.2)	8 (4.3)	1.000
Others	6 (0.2)	5 (2.7)	0.685
Overall morbidity, *n*	108 (45.2)	62 (33.5)	0.017
Overall morbidity after excluding patients with PF alone	88 (36.8)	58 (31.4)	0.258
90-day mortality	17 (7.1)	16 (8.6)	0.558

PPH, post pancreatectomy haemorrhage; AF, atrial fibrillation; PF, pancreatic fistula

There was no significant difference in the overall PF rate, 90-day mortality and length of hospital stay between both methods. Study also says that experience and familiarity of the surgeon with one particular reconstruction technique is perhaps more important than the type of reconstruction itself.

In 2015 a Meta analysis was published, included 7 Randomized controlled trails.

First author	Year	No of patients
Yeo	1995	145
Bassi	2005	151
Duffas	2005	149
Fernandez-Cruz	2008	108
Wellner	2012	116
Figueras	2013	123
Topal	2013	329

It had concluded that that PG is superior to PJ for reconstruction after PD. PG is associated with significantly lower pancreatic and biliary fistula rates and a shorter length of hospital stay than PJ.

A recent Multi centric Randomized controlled trail conducted in Germany RECOPANC TRAIL (DRKS 00000767) Pancreatogastrostomy Versus Pancreatojejunostomy for RECOnstruction after PANCreatoduodenectomy was published in March 2016.

Fourteen German academic centres with a median case load of 78 major pancreatic resections per year from the Association of German University had participated in the trial.

TABLE 2. Primary Endpoint Analysis

		Univariate Analysis		
Parameter	Total n	No/POPF A n (%)	POPF B/C n (%)	*P*
All patients	320	253 (79%)	67 (21%)	—
PJ	149	116 (78%)	33 (22%)	0.617
PG	171	137 (80%)	34 (20%)	

	Multivariate Analysis			
Parameter	Odds Ratio	Lower CI	Upper CI	*P*
PG vs PJ	0.864	0.495	1.507	0.607
Age, yr	0.988	0.966	1.011	0.318
Soft vs hard pancreatic texture	2.094	1.145	3.827	0.016
Center location (north vs south)	1.048	0.58	1.896	0.876
Surgeon volume 10–25 vs >25 PD/yr	1.578	0.822	3.029	0.863
Surgeon volume <10 vs >25 PD/yr	2.801	1.155	6.794	0.064

The rate of grade B/C fistula after PG versus PJ was not different. Hemorrhagic complications were more in PG group when compared to PJ group. Over all the study concludes that there is no significant difference in development of pancreatic fistula in both groups.

MATERIALS AND METHODS

Patients subjected to this study were taken from General surgical & Surgical gastroenterology wards of Government Rajaji Hospital, Madurai over a period of 18 months years from January 2015 to July 2016.

Patients who undergo Pancreaticoduodenectomy at GRH Madurai are recruited in this study.

ELIGIBILITY CRITERIA:

INCLUSION CRITERIA:

Patients underwent PD for

Malignant /benign Pancreatic tumours

Chronic Pancreatitis

Extra pancreatic tumours

(Periampullary,biliary,duodenal)

EXCLUSION CRITERIA:

Tumours extending into the body of the pancreas

Tumours with metastasis.

Invasion of major vessels

Invasion of transverse mesocolon

Liver & Peritoneal Metastasis

Pt who didn't give consent for study

Following consent, a questionnaire will be filled to record the patient's demographic data, duration of disease; method of surgery pt had undergone, and post operative course & complications.

SURGICAL TECHNIQUE:

All the patients were anesthetised by General anaesthesia +/- Epidural anaesthesia.

Chevron's (Bilateral Sub Costal) incision was given in all patients.

- Cattell-Braasch manuovre was done by mobilizing the entire right colon to the left.

- Extended Kocherisation was done upto left border of aorta.

- Anterior surface of pancreas was exposed by incising gastro-colic ligament and distal gastro-splenic ligament after coagulating and dividing the vessels using Harmonic ace shears.

- Adhesions between stomach and pancreas were released.

- The plane between anterior aspect of portal vein and posterior aspect of pancreatic neck was created by following the middle colic vein and then the SMV.

- Cholecystectomy was done after ligating and dividing the cystic artery and duct and dissecting it from its fossa.

- Common Bile Duct (CBD) and Common Hepatic Duct (CHD) were mobilized by dissecting them from the portal vein posteriorly and hepatic artery on the left side.

- Bile duct was transected at distal CHD.

- Distal gastrectomy was done after coagulating and and dividing Right gastric, Right gastro-epiploic and gastrodudenal arteries using Harmonic ace shears.

- Pancreatic neck was transected and bleeding vessels coagulated.

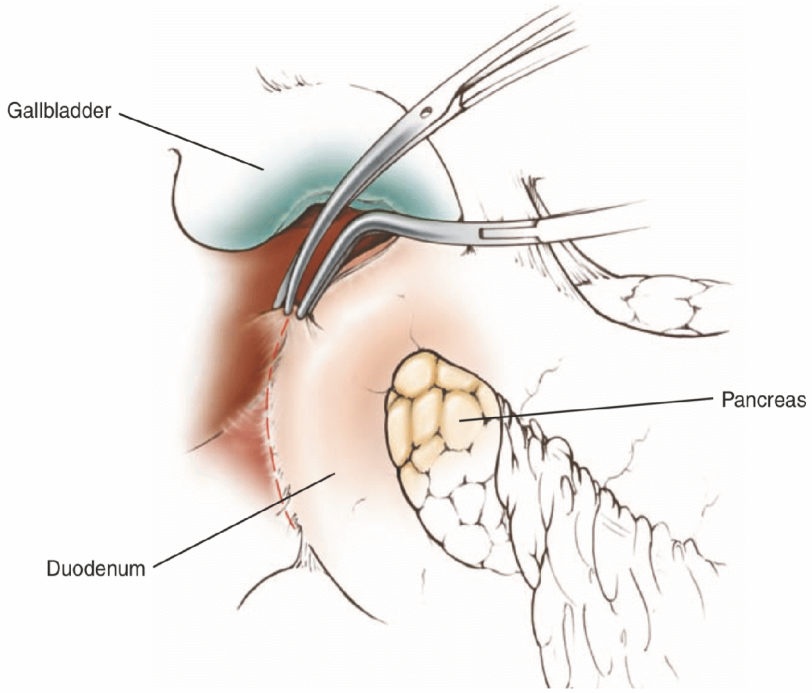
- Jejunum was divided 20 cms distal to duodeno-jejunal flexure.

- Duodeno-jejunal flexure was taken down, coagulating and dividing the vessels using harmonic ace shears.

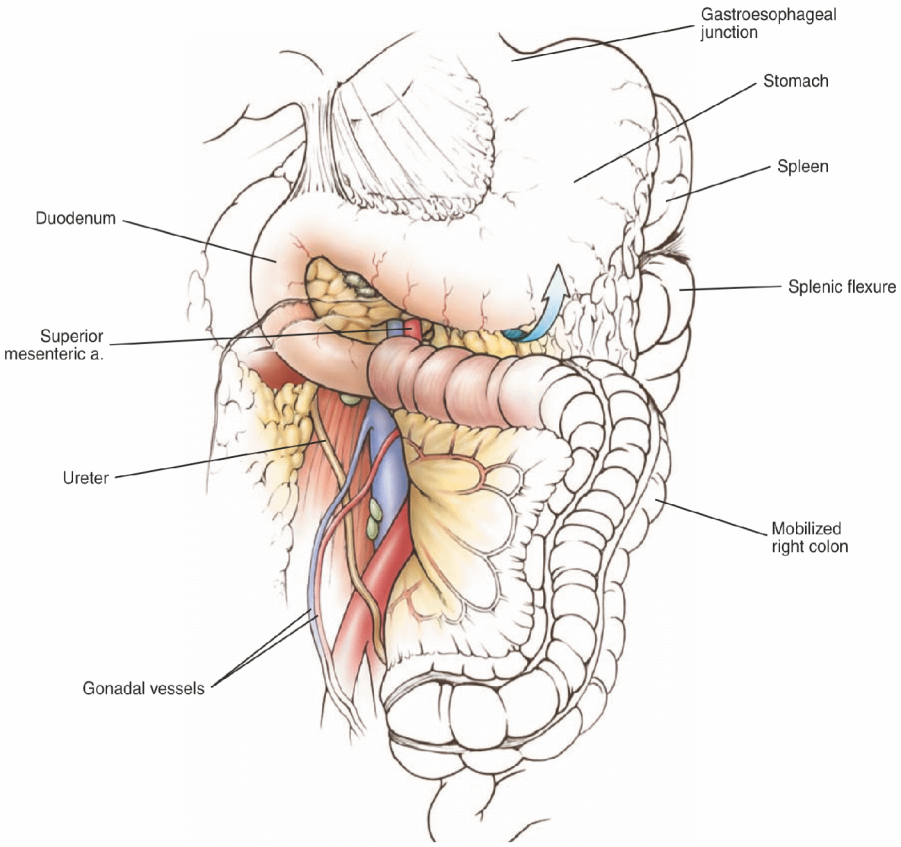
- The proximal part of the jejunum was brought to the right side by passing posterior to the SMA and SMV.

- Pancreatic head and Uncinate process were dissected off from the portal vein by coagulating and dividing the tributaries using harmonic ace shears.

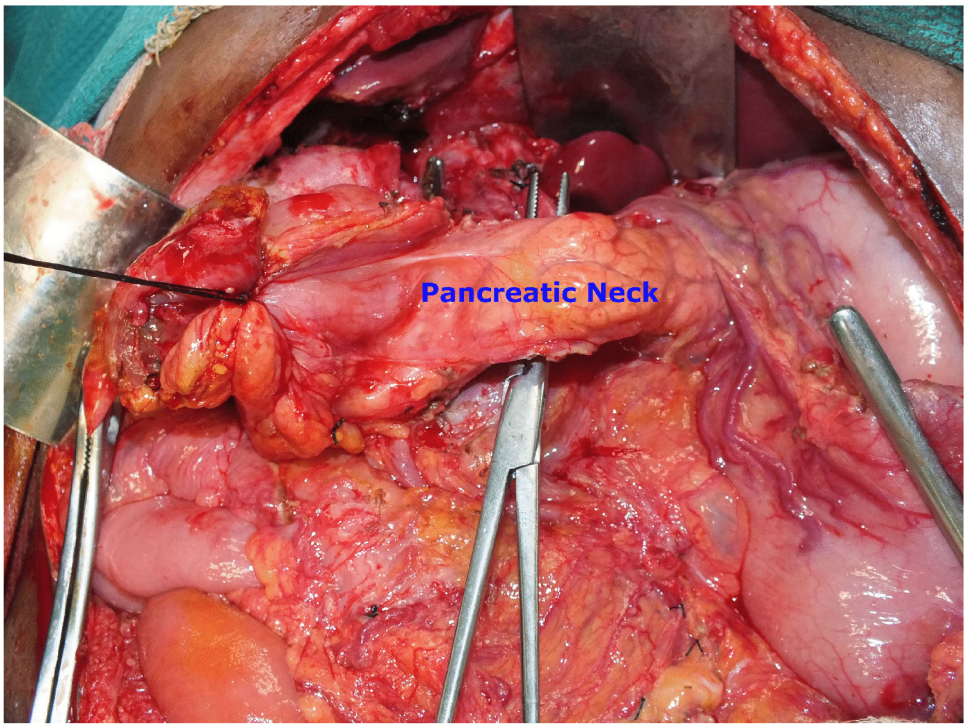
- The specimen containing antrum of stomach, entire duodenum, proximal 20 cms of jejunum, pancreatic head, uncinate process & neck, Gall Bladder and CBD was removed.



Kocherisation



Cattell-Braasch manuovre



Point of NO RETURN in Whipples – Pancreatic Transaction

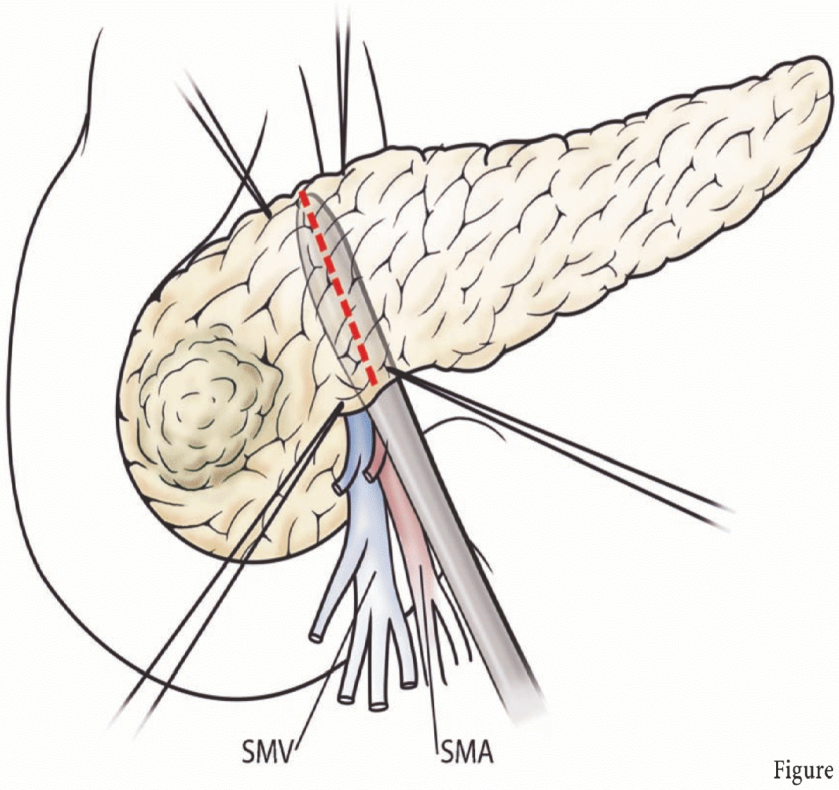
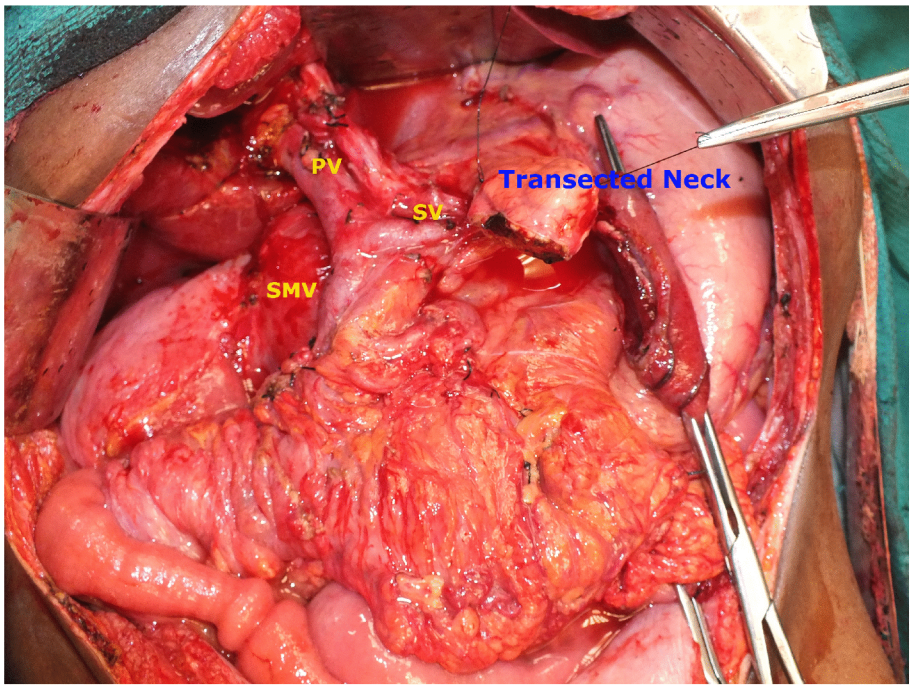


Figure 12.17

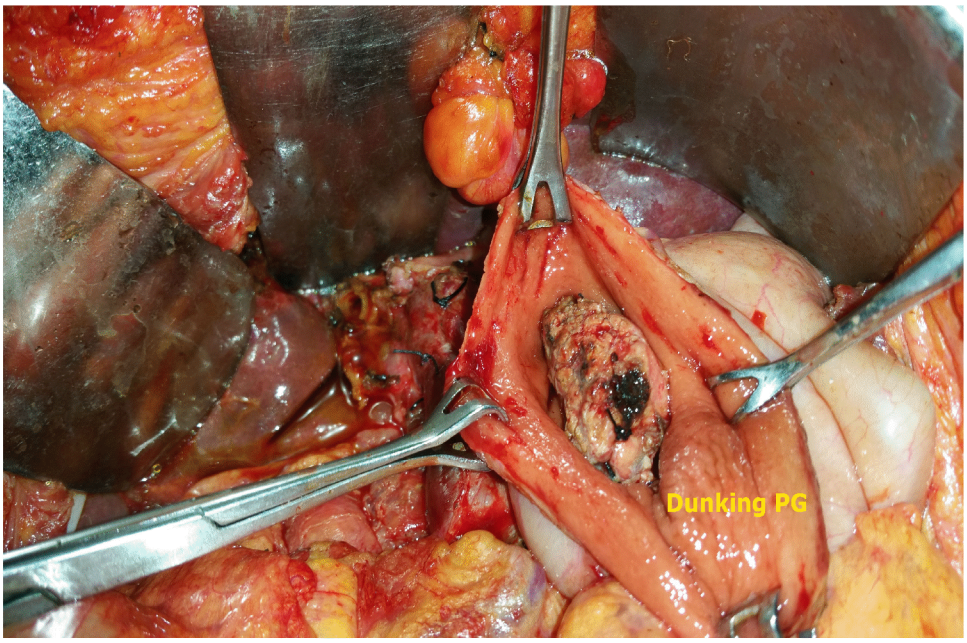


Posterior bed of pancreatic neck after dissection

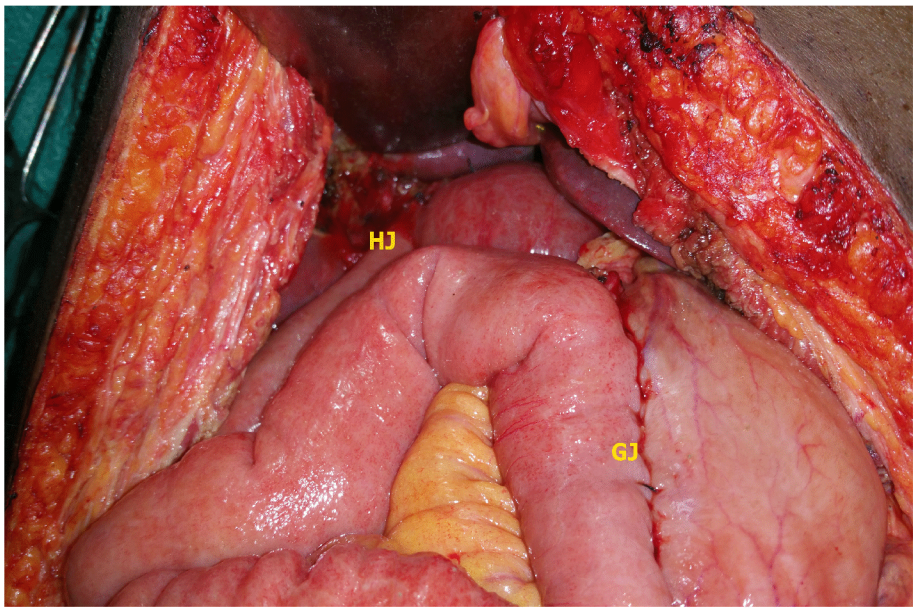
(SMA/SMV- Sup Mesentric Artery/Vein, PV-Portal Vein, SV-Splenic Vein)

For reconstruction of PG,

A 3–4 cm stump of the pancreatic remnant was freed from the splenic vein and retroperitoneum. The pancreatic stump was dunked into the mid-body posterior wall of the stomach and anastomosis was done by a single layer with nonabsorbable Continuous sutures/Intermittent Sutures using 3-0 Prolene/3-0 silk. No duct-to-mucosa anastomosis was used, no Stent was placed.



Dunking Pancreaticogastrostomy through Posterior wall of stomach



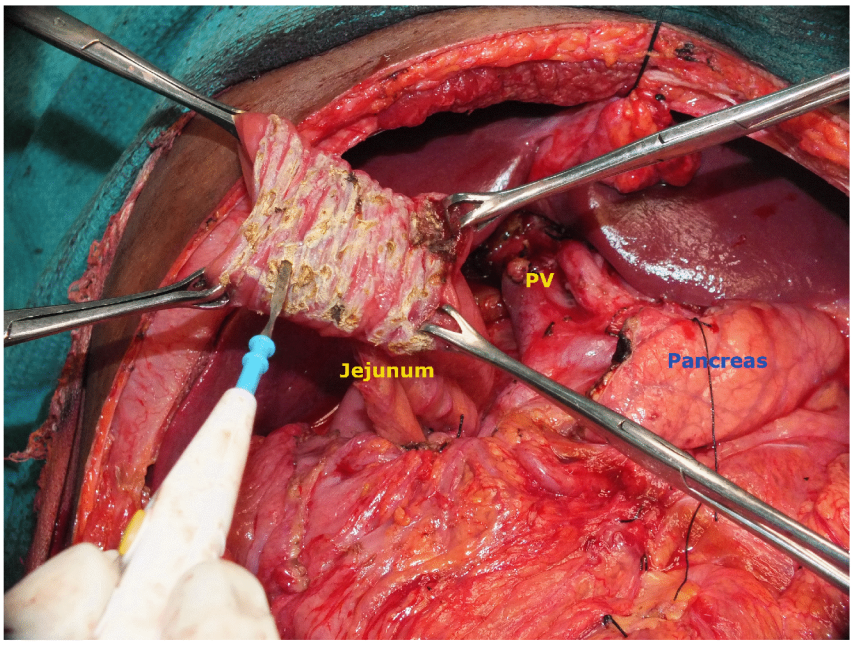
After Completion of Hepaticojejunostomy(HJ), Gastrojejunostomy (GJ).

For reconstruction of binding-PJ:

- End of the jejunum was closed in 2 layers – inner 3/0 vicryl and outer 3/0 silk and then brought in retro-colic manner.

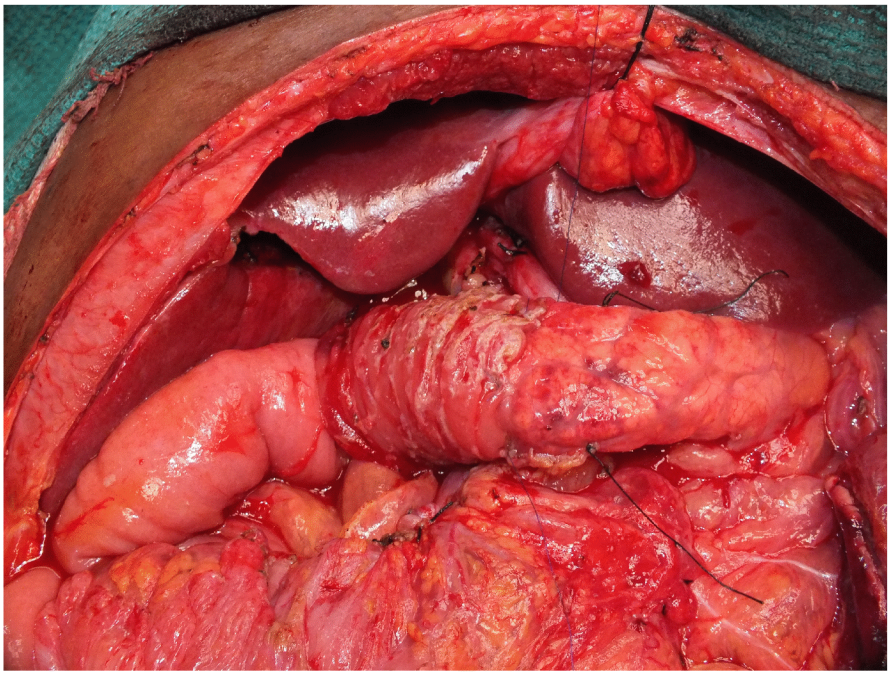
Stump of the jejunum was averted for a length of 3 cm; the jejunal mucosa was destroyed by applying cautery (Spray Mode). The remnant of the pancreas was dissected for a distance of more than 3 cm from its cut edge. The cut edge of the pancreatic stump and the averted jejunum were anastomosed with 4-0 prolene in a circular fashion, averted jejunum was restored to its normal position to wrap over the pancreatic stump; an non absorbable ligature (2-0 silk) was then looped around the jejunum, with the invaginated pancreas inside, it is tightened enough to pass tip of haemostat artery clamp.

No Pancreatic Stent was placed in all cases.

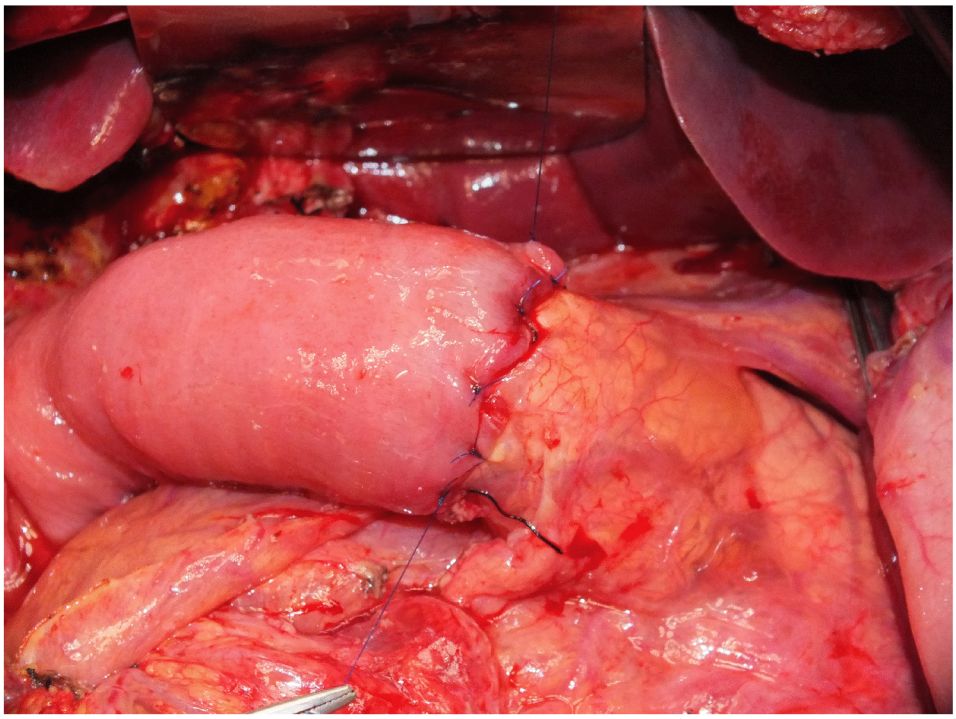


Charring of Averted Jejunal Mucosa by using Cautery

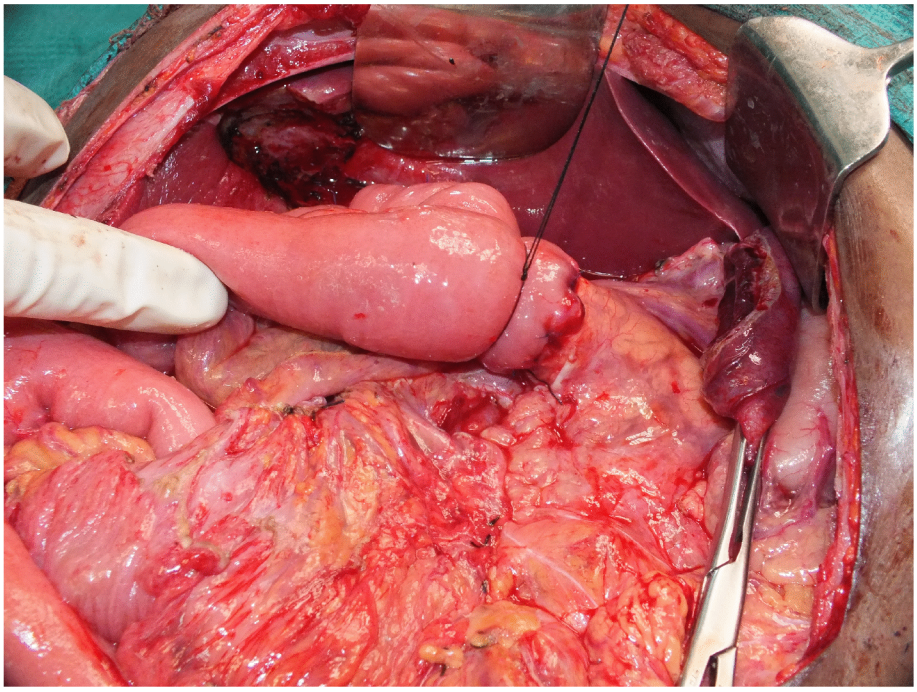
PV- Portal Vein



Anastomosis of averted jejunal end to pancreatic Edge



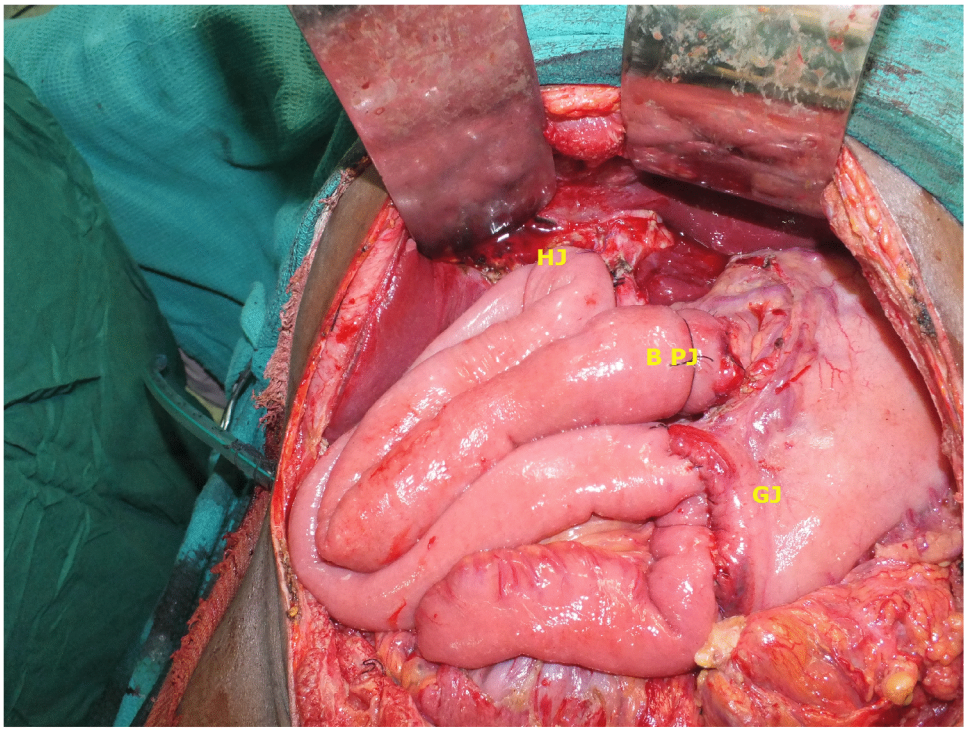
Averted jejunum brought back to normal position and end fixed to pancreas with 4-0 prolene



Binding Ligature Applied

- End to side Hepatico – jejunostomy(HJ) was done in single layer using interrupted 3/0 vicryl plus.

- End to side Gastro-Jejunostomy was done 45 cms distal to H-J in 2 layers – inner 2/0 PDS and outer 3/0 silk.



After completion of Triple anastomosis Binding PJ, HJ, GJ

- Witzel's feeding jejunostomy was done, 20 cms distal to G-J using No.10 infant feeding tube.

- Complete haemostasis was obtained.

- Peritoneal lavage was done using Nacl.

- Tube drains were kept in both the flanks.

- Wound was closed in layers – No.1 Vicryl for inner musculo-aponeurotic layers and No.1 Prolene for outer musculo-aponeurotic layers.

- Skin was approximated using 2/0 ethilon.

Post operative course of the patient is noted down. The primary end point of the study is to note down the pancreatic fistula occurrence in both groups. The secondary endpoints are to note down overall post op complications causing post operative morbidity.

Definition of post operative complications:

Post Operative Pancreatic Fistula (POPF): Defined as the drain fluid amylase level being 3 times the upper limit of the normal Serum amylase level from the third postoperative day.

Biliary leakage: Defined as bile in the drain fluid from the subhepatic drain.

Gastro-enteric anastomosis leakage: Defined as a persistent discharge of digestive juice in the drainfor more than 5 days postoperation, and leakage confirmed by the methylene blue test or by radiology.

Delayed gastric emptying: Defined to be present when the nasogastric tube was maintained for 10 or more days, combined with at least one of the following: vomiting after removal of nasogastric tube, reinsertion of nasogastrictube, or failure to progress with oral feeding.

Acute pancreatitis: Defined as a more than 3-fold increase in serum or lipase from postoperative day 4 onward with a compatible clinical course or findings on computed tomography.

Intraperitoneal hemorrhage: Defined to be present when more than 3 units of blood were required in any 24 hours after the operation.

Intraperitoneal fluid collection: Defined as a collection of fluid that measured more than 5 cm in diameter on ultrasound or computed tomography.

Intraperitoneal abscess: Defined as a collection of pus, with or without necrotic tissue, but with a positive bacterial culture.

Wound infection: Defined as erythema and induration of a wound with purulent discharge and with a positive bacterial culture.

Wound dehiscence: Defined as partial or total disruption of the fascial or all the layers of the incision.

Pulmonary infection: Defined as the presence of pneumonia, or atelectatic changes on radiograph, and was associated with a positive sputum bacterial culture.

Pleural effusion: Complication when the collection of fluid caused dyspnea, and chest tapping was required to relieve the symptoms.

Mortality: Any death occurring in first 30 days of Post operative Period.

OBSERVATION AND

DISCUSSION OF THE STUDY

The total number of cases studied is 45 which included 25 female and 20 male patients. Patients were admitted & operated in General surgical & Surgical Gastroenterology wards in Government Rajaji Hospital, Madurai.

Among 45 cases, pancreaticogastrostomy was done in 24 patients; binding pancreaticojejunostomy was done in 21 patients.

Among 45 cases, one patient was aged below 25 yrs, 26 patients were in age group 26-50 yrs, while 18 patients were from 51-75 yrs age group.

Out of 24 pts from PG group, 10 were males & 14 were females.

From Binding PJ group, out of 21, 10 were males & 11 were females.

RESULTS

Table – 1

Age Distribution

Age in years	Group PG	Group PJ
< 25	1	0
26 – 50	13	13
51 – 75	10	8
Total	24	21
Mean	49.29	50.62
SD	12.08	9.23
P value	0.684 Not significant	

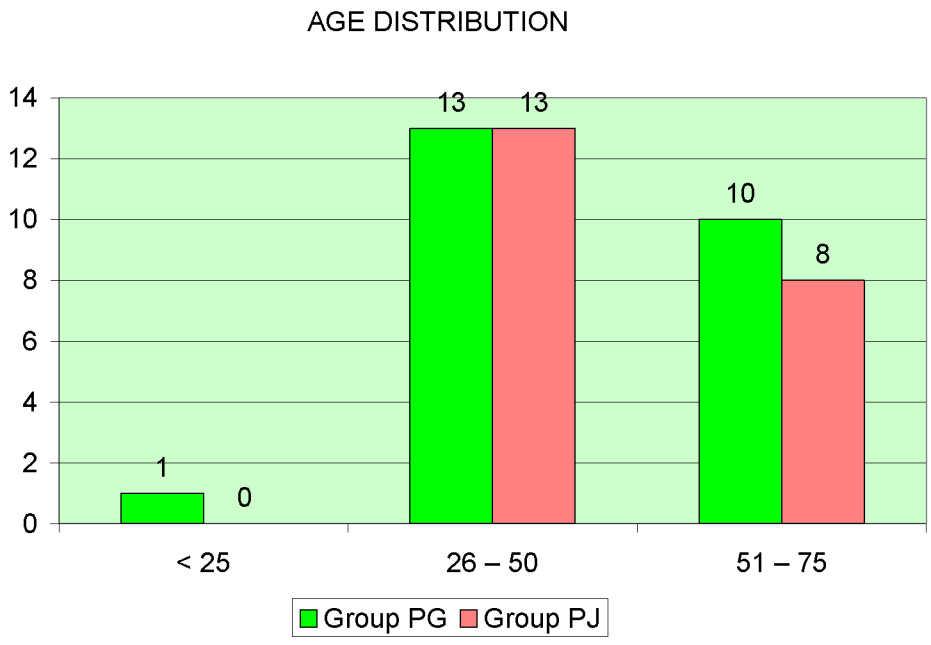


Table – 2

Gender Distribution

Gender	Group PG	Group PJ
Male	10	10
Female	14	11
Total	24	21
P value	0.983 Not significant	

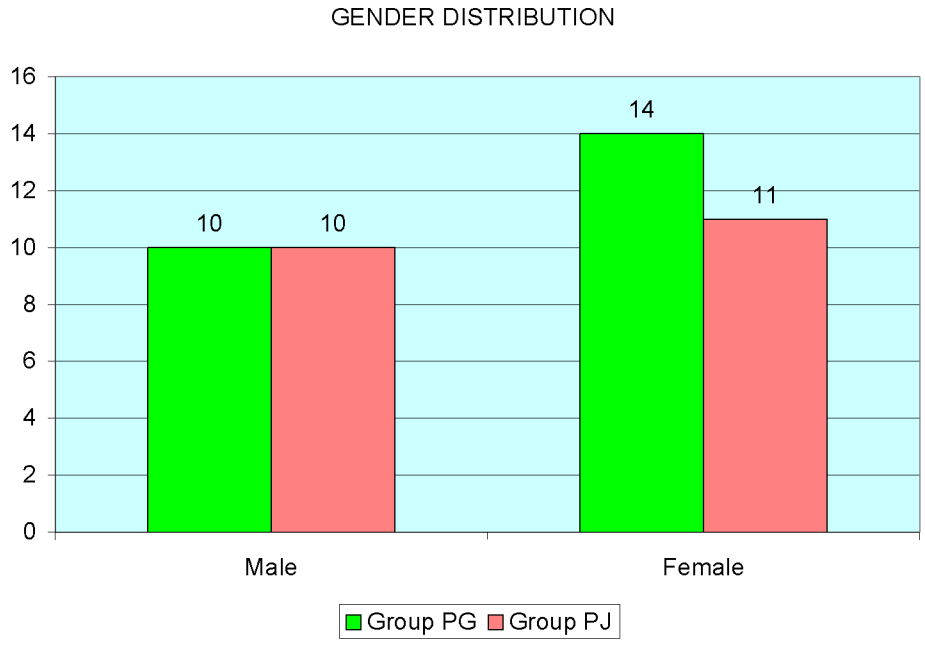
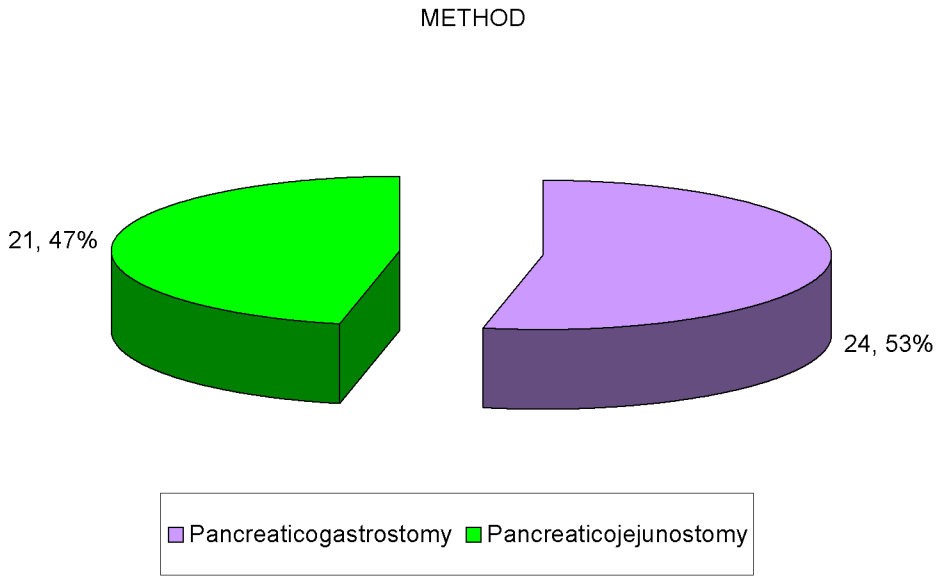


Table – 3

Type of surgery

Method	No.of cases
Pancreaticogastrostomy	24
Pancreaticojejunostomy	21
Total	45



Post Operative Pancreatic Fistula (POPF)

Table – 4

Group	Post operative Pancreatic Fistula (POPF)	
	No.of cases	%
Pancreaticogastrostomy (24)	4	16.6
Pancreaticojejunostomy (21)	3	14.2
P value	0.826	Not significant

Out of 24 patients who had under gone pancreaticogastrostomy, 4 patients (16.6%) developed Post operative Pancreatic Fistula (POPF); while out of 21 patients who had under gone Binding Pancreaticojejunostomy 3 patients (14.2%) developed POPF

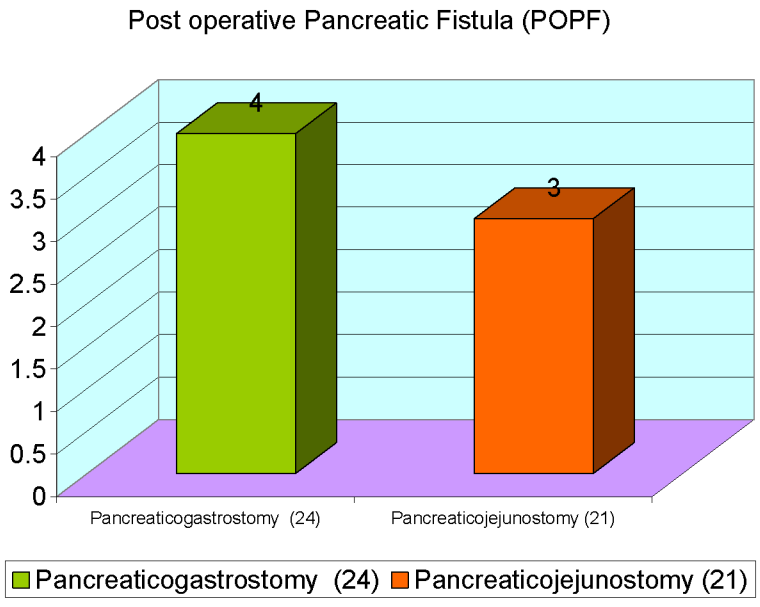
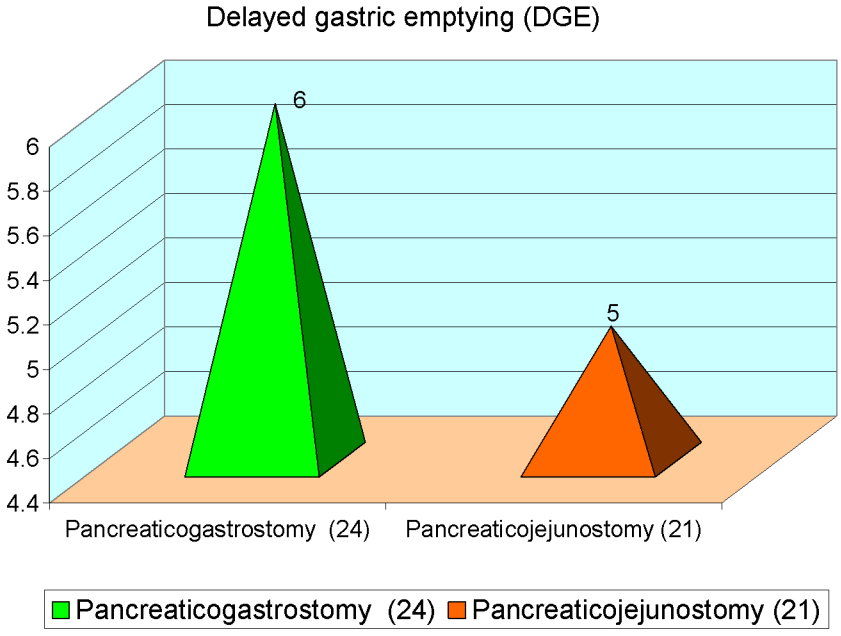


Table – 5

Delayed gastric emptying (DGE)

Group	**Delayed gastric emptying (DGE)**	
	No.of cases	%
Pancreaticogastrostomy (24)	6	25
Pancreaticojejunostomy (21)	5	23.8
P value	0.791	Not significant

6 out of 24 patients **(25%)** developed from **PG** group, while in **Binding PJ** Group, 5 out of 21 patients **(23.8%)** developed DGE.



Gastro-enteric anastomosis leakage

Table – 6

Group	**Gastro-enteric anastomosis leakage**	
	No.of cases	%
Pancreaticogastrostomy (24)	1	4.1
Pancreaticojejunostomy (21)	0	0

Gastro-enteric anastomosis leakage:

Only one patient **(4.1%)** from PG group developed GE Anastomosis leakage, While None developed leakage from Binding PJ Group.

Biliary Leakage:

One patient from PG Group (4.1%) developed biliary leakage; while none from Binding PJ group.

Acute Pancreatitis:

One from Binding PJ (4.7%) group Developed Pancreatitis

Intra Peritoneal Haemorrhage:

Table – 7

Group	Intra Peritoneal Haemorrhage	
	No.of cases	%
Pancreaticogastrostomy (24)	2	8.2
Pancreaticojejunostomy (21)	1	4.7

2 out of 24 patients in PG group developed Haemorrhage

1 out of 21 patients in Binding PJ group developed Haemorrhage.

Intra peritoneal Fluid collection:

Table – 8

Group	Intra peritoneal Fluid collection	
	No.of cases	%
Pancreaticogastrostomy (24)	6	25
Pancreaticojejunostomy (21)	7	33

6 out of 24 patients in PG group developed fluid collection.

7 out of 21 patients in binding PJ group developed fluid collection.

Table – 9

Intra peritoneal Abscess

Group	**Intra peritoneal Abscess:**	
	No.of cases	%
Pancreaticogastrostomy (24)	0	0
Pancreaticojejunostomy (21)	1	4.7

One Patient from Binding PJ group developed abscess. None developed from PG group

Table – 10

Wound infection

Group	**Wound infection**	
	No.of cases	%
Pancreaticogastrostomy (24)	7	29.1
Pancreaticojejunostomy (21)	7	33

Wound infection:

7 Patients out of 24 patients from PG group developed wound infection; while from Binding PJ group 7 developed, out of 21 patients.

Table – 11

Wound Dehiscence

Group	Wound Dehiscence	
	No.of cases	%
Pancreaticogastrostomy (24)	2	8.2
Pancreaticojejunostomy (21)	1	4.7

Wound Dehiscence:

2 Patients from PG group developed dehiscence; while from Binding PJ group one patient developed dehiscence.

Table – 12

Pulmonary infection

Group	Pulmonary infection	
	No.of cases	%
Pancreaticogastrostomy (24)	6	25.0
Pancreaticojejunostomy (21)	4	18.8

Pulmonary infection

6 Patients from PG Group developed pulmonary infection; while 4 patients from Binding PJ group developed pulmonary infection.

Pulmonary effusion:

One patient from each group developed effusion.

Table – 13

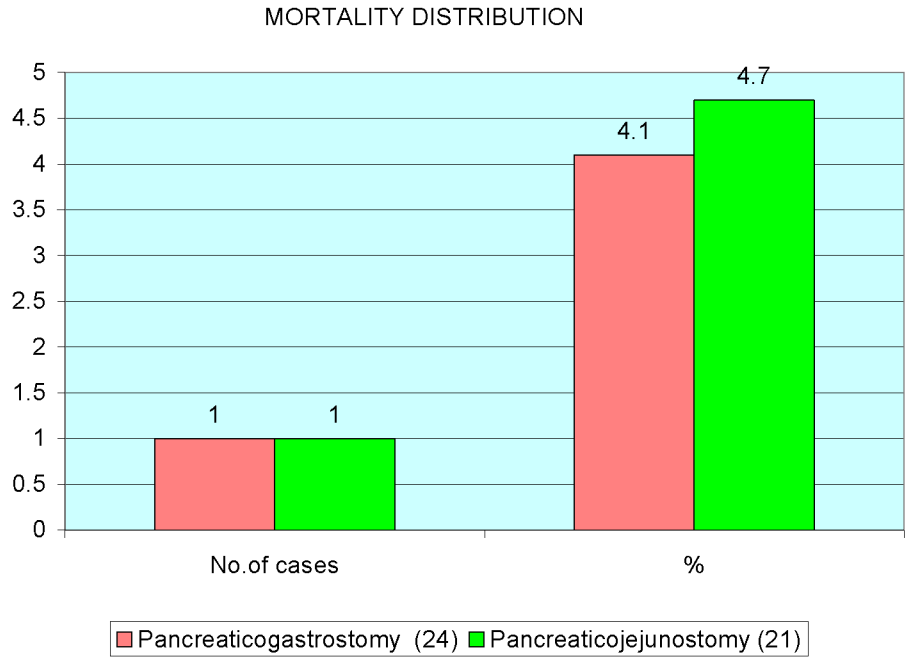
Mortality

Group	Mortality	
	No.of cases	%
Pancreaticogastrostomy (24)	1	4.1
Pancreaticojejunostomy (21)	1	4.7

While that of mortality rate from the present study is 4.1% in PG Group; while from Binding PJ group it is 4.7%.

In binding PJ group, patient expired due to Post operative secondary haemorrhage, secondary to Pancreatic Fistula.

In PG group, patient expired on 6th post operative day due to acute pulmonary embolism.



CONCLUSION

There was no statistically significant difference (p Value>0.05) between two groups in terms of Post operative pancreatic fistula (POPF) which is primary end point of this study.

The PF rate was 16.6% in PG group; while in Binding PJ Group it is 14.2%. Other post operative complications rates were almost equal in both groups.

Mortality occurred in both groups(<5%), mortality in PG group was due to acute pulmonary embolism; while in Binding PJ group it was due to Post operative secondary haemorrhage, secondary to Pancreatic Fistula.

Over all morbidity in PG group was 14.5% & in Binding PJ group was 12.5%.

Perhaps personal preference, experience and familiarity of the surgeon with reconstruction technique is more important than the reconstruction method per se as there is no significant difference in mortality n morbidity in both groups.

BIBLIOGRAPHY

1) Shackelford's Surgery of the Alimentary Tract 7th Edition, Pages 1110-1285.

2) Blumgarts Surgery of the liver, billary Tract And Pancreas 5th Edition pages 922-966.

3) Master of Surgery – Fischer 5th edition 2nd volume, pages 1222-1317.

4) Anatomic Basis of Tumour Surgery 2nd Edition William C Wood, pages 550-600.

5) Comparison between Pancreaticojejunostomy and pancresticogastrostomy after pancreaticoduodenectomy. Wen-Liang Fang, Yi-Ming Shyr, Cheng-Hsi Su, Tien-Hua Chen, Chew-Wun Wu, Wing-Yiu Lui J Formos Med Assoc 2007;106(9):717–727

6) Pancreaticojejunostomy versus Pancreaticogastrostomy after Pancreaticoduodenectomy: A Systematic Review and Meta-Analysis Dig Surg 2013;30:56–69

7) Reconstruction by pancreaticojejunostomy versus pancresticogastrostomy following pancreatectomy – a comparative study Annals of Surgery • Volume 242, Number 6, December 2005

8) Pancreatogastrostomy Versus Pancreatojejunostomy for RECOnstruction After PANCreatoduodenectomy (RECOPANC, DRKS 00000767). Annals of Surgery. Volume 263, Number 3, March 2016.

9) Preliminary results of binding pancreaticojejunostomy, Korean J Hepatobiliary Pancreat Surg 2014;18:21-25

10) Outcomes comparing a pancreaticogastrostomy (PG) and a pancreaticojejunostomy (PJ) after a pancreaticoduodenectomy (PD), HPB 2011, 13, 723–731.

11) Pancreaticogastrostomy Is Superior to Pancreaticojejunostomy for Prevention of Pancreatic Fistula After Pancreaticoduodenectomy. Annals of Surgery, Volume 261, Number 5, May 2015.

12) Conventional Versus Binding Pancreaticojejunostomy After Pancreaticoduodenectomy A Prospective Randomized Trial, Annals of Surgery Volume 245, Number 5, May 2007.

13) Pancreaticogastrostomy Compared with Pancreaticojejunostomy after pancreaticoduodenectomy, Eur J Surg 1999; 165: 357–362.

14) Shrikehande SV, Qureshi SS, Rajneesh N, et al. Pancreatic anastomoses after pancreaticoduodenectomy: do we need further studies. World J Surg. 2005;29:1642–1649.

15) Yeo CJ, Cameron JL, Maher MM, et al. A prospective randomized trial of pancreaticogastrostomy versus pancreaticojejunostomy after pancreaticoduodenectomy. Ann Surg. 1995;222:580 –588.

16) Buechler MW, Friess H, Wagner M, et al. Pancreatic fistula after pancreatic head resection. Br J Surg. 2000;87:833– 839.

17) Peng SY, Mou YP, Liu YB, et al. Binding pancreaticojejunostomy: 150 consecutive cases without leakage. J Gastrointest Surg. 2003;7: 898 –901.

PROFORMA

Name :- I. P. No

Age :- ward :-

Sex :- D.O.A :-

Occupation :- D.O.D :-

Address :-
Phone no :-

PRESENTING COMPLAINTS

1) H/o Jaundice (Duration, waxing and waning episodes)
2) H/o pain abdomen, vomiting, GI Bleed
3) H/o pruritus, passage of Clay colored stools
4) Co existing comorbidities (Diabetes mellitus…)
5) H/o Smoking / Alcohol consumption

GENERAL PHYSICAL EXAMINATION

1. General survey
2. Body build and nourishment
3. Appearance
4. Attitude: Restless/ Quiet
5. Dehydration: Mild/ Moderate/ Severe/ Nil
6. Anaemia/ Jaundice/ Clubbing/ Cyanosis/ Lymphadenopathy/ Pedal oedema
7. Pulse
8. Temperature

9. Respiratory rate

10. Blood pressure

Per Abdomen Examination:-

1. INSPECTION

2. PALPATION

3. PERCUSSION

4. AUSCULTATION

SYSTEMIC EXAMINATION

- Cardiovascular system
- Respiratory system
- Central nervous system

Investigations :

HB/PCV: LFT:

T.Protien/Albumin/Globulin PT/INR:

RFT (BUN & Creatinine):
RBS/FBS/PPBS:

OGD:

USG Abdomen & Pelvis:

CT Abdomen & pelvis:

MRI/MRCP:

Biopsy Report(if any):

Pre op Drainage (CBD Stenting/PTBD; If any):

Diagnosis:

Procedure Done: Pancreaticoduodenectomy

Pancreatic anastomosis:

Pancreaticogastrostomy / Binding
Pancreaticojejunostomy

Duration of surgery:

Intra op blood loss:
Post op complications:

1) **Pancreatic anastamosis leakage:**
2) **Biliary leakage**:
3) **Gastro/duodenal-enteric anastomosis leakage:**
4) **Delayed gastric emptying:**
5) **Acute pancreatitis**:
6) **Intraperitoneal hemorrhage:**
7) **Intraperitoneal fluid collection:**
8) **Intraperitoneal abscess**:
9) **Wound infection:**
10) **Wound dehiscence:**
11) **Pulmonary infection:**
12) **Pleural effusion:**

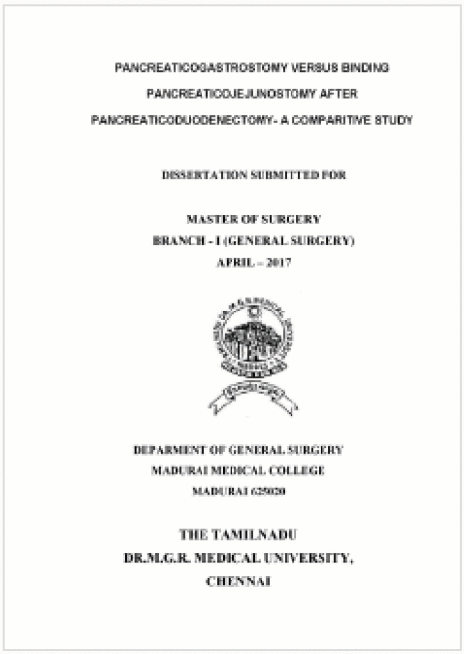
turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	221411113 Ms Gensur Muppalla N...
Assignment title:	2015-2015 plagiarism
Submission title:	PANCREATICOGASTROSTOMY V...
File name:	Dr._Neelendran_General_Surgery_...
File size:	32.05M
Page count:	81
Word count:	7,563
Character count:	42,482
Submission date:	16-Sep-2016 10:16PM
Submission ID:	705757178



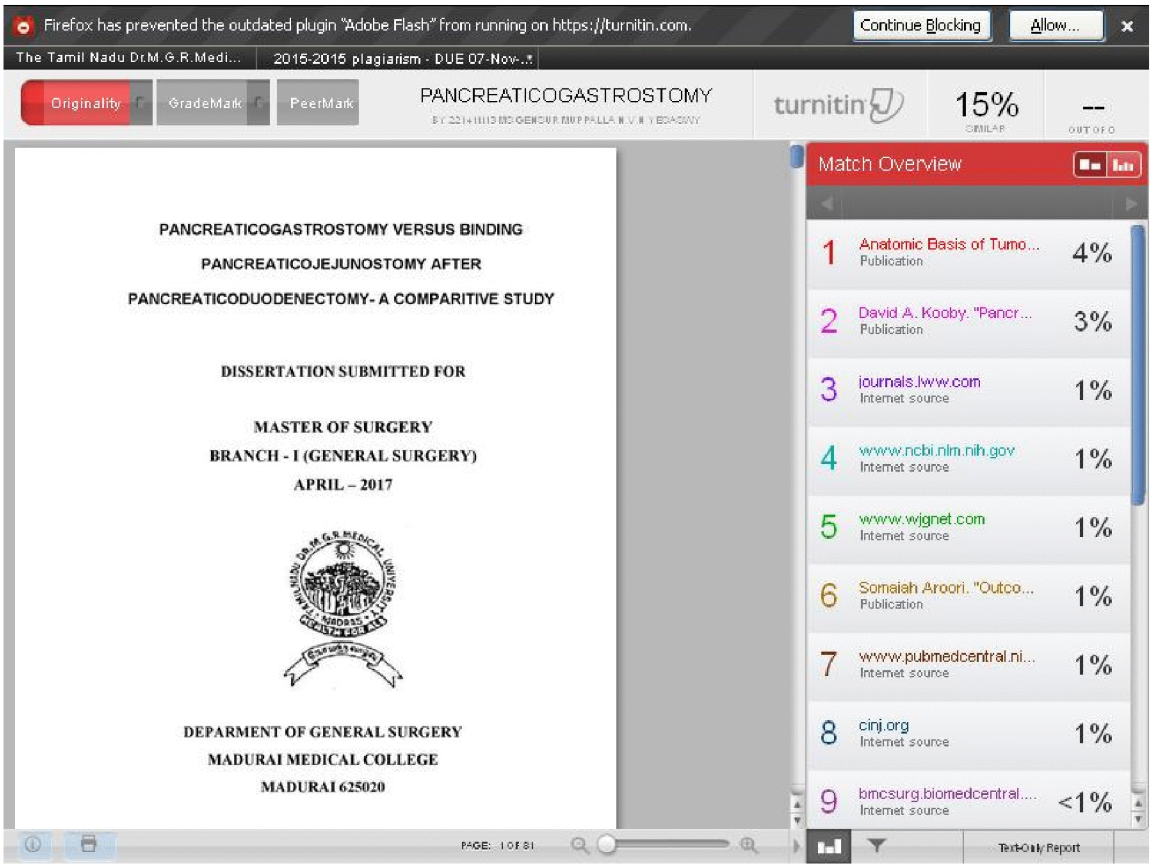
PANCREATICOGASTROSTONY VERSUS BINDING
PANCREATICOJEJUNOSTOMY AFTER
PANCREATICODUODENECTOMY- A COMPARITIVE STUDY

DISSERTATION SUBMITTED FOR

MASTER OF SURGERY
BRANCH - I (GENERAL SURGERY)
APRIL – 2017

DEPARMENT OF GENERAL SURGERY
MADURAI MEDICAL COLLEGE
MADURAI 625020

THE TAMILNADU
DR.M.G.R. MEDICAL UNIVERSITY,
CHENNAI


Firefox has prevented the outdated plugin "Adobe Flash" from running on https://turnitin.com.
Continue Blocking
Allow...
The Tamil Nadu Dr.M.G.R.Medi...
2015-2015 plagiarism - DUE 07-Nov-...
Originality
GradeMark
PeerMark
PANCREATICOGASTROSTOMY
turnitin
15%
SIMILAR
--
OUT OF 0
PANCREATICOGASTROSTOMY VERSUS BINDING
PANCREATICOJEJUNOSTOMY AFTER
PANCREATICODUODENECTOMY- A COMPARITIVE STUDY
DISSERTATION SUBMITTED FOR
MASTER OF SURGERY
BRANCH - I (GENERAL SURGERY)
APRIL – 2017
DEPARMENT OF GENERAL SURGERY
MADURAI MEDICAL COLLEGE
MADURAI 625020
PAGE: 1 OF 81
Match Overview
1 Anatomic Basis of Tumo... Publication 4%
2 David A. Kooby, "Pancr... Publication 3%
3 journals.lww.com Internet source 1%
4 www.ncbi.nlm.nih.gov Internet source 1%
5 www.wjgnet.com Internet source 1%
6 Somaiah Aroori, "Outco... Publication 1%
7 www.pubmedcentral.ni... Internet source 1%
8 cinj.org Internet source 1%
9 bmcsurg.biomedcentral.... Internet source <1%
Text-Only Report